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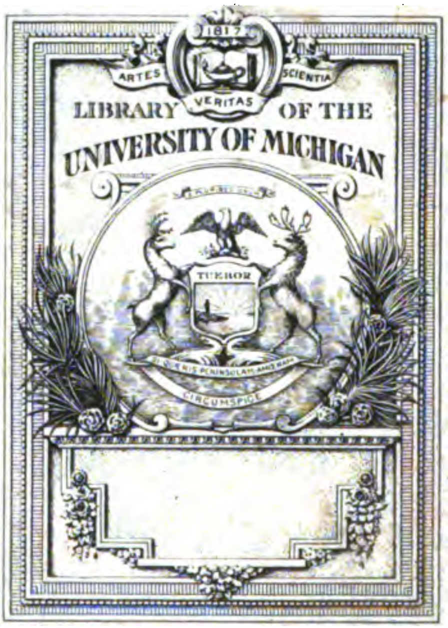

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DOCUMENTS

OF THE

SENATE

OF THE

STATE OF NEW YORK

ONE HUNDRED AND THIRTY-SEVENTH SESSION

1914

VOL. I.— NOS. 1 TO 5, INCLUSIVE

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J. B. LYON COMPANY, PRINTERS
1914

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MESSAGE

OF THE

GOVERNOR

OF THE

State of New York

Transmitted to the Legislature January 7, 1914

ALBANY
J. B. LYON COMPANY, PRINTERS
1914

gating Commission are progressive milestones in industrial legislation. The reorganization of the State Health Department puts us abreast of the best hygienic standards of Europe, and our Workmen's Compensation Act occupies a prominent place in the Nation's progressive laws. The investigation of irregularities in State departments is being vigorously pushed and will not stop until the guilty have been discovered and punished. What is of equal importance, steps are being taken to prevent a recurrence of such crimes against the State.

THE PROBLEM WHICH CONFRONTS THE STATE.

The most serious problem now confronting us is the question of State finances.

The problem is a hard one. It demands careful thought and heroic treatment. For several years our indirect taxes met the running expenses of the State Government and left a comfortable surplus. A prodigality in expenditure, a recklessness in appropriations, the repairs to the Capitol, made necessary by the fire, the erection of the State Educational Building, permanent improvements on an extensive scale in our charitable and penal institutions, the highway maintenance expense, together with the sinking fund contributions and the interest charges upon the canal and highway debt, have produced an acute financial situation.

This Legislature faces requests for appropriations amounting approximately to $63,000,000. Our receipts for the coming year from indirect sources are estimated at $41,000,000.

We cannot materially increase our receipts; we must decrease our expenditures. To meet the difference between our income and the expenditures requested would mean the imposition of a direct tax of two and one-fourth mills upon the taxpayers of the State. The exactions of local taxation are already so burdensome in our various municipalities that such a tax would be a hardship upon our people.

This burden must be avoided by a curtailment in the State's expenses, by the refusal to grant a single unnecessary dollar for any public purpose, and by a determination to see that the State gets a dollar's worth of service or a dollar's worth of material for every dollar expended.

STATE OF NEW YORK

No. 4.

IN SENATE

FEBRUARY 2, 1914.

MESSAGE FROM THE GOVERNOR

RELATIVE TO

THE ALIEN INSANE.

STATE OF NEW YORK — EXECUTIVE CHAMBER.

ALBANY, *February* 2, 1914.

TO THE LEGISLATURE:

Nearly a third of those committed to New York's hospitals for the insane are citizens of foreign countries. More than a third of the money spent in the maintenance of New York's hospitals for the insane is devoted to the care of aliens.

Statistics compiled last year show that in 1912 there were 31,624 insane inmates of New York's hospitals. Of these, 13,728 were foreign born. Only 4,487 of the foreign born had been naturalized, so that 9,241, or 29.2 per cent. of the total insane population were aliens.

In 1912 out of 4,570 insane patients in Manhattan State Hospital 2,526 were foreign born and only 708 had been naturalized. Out of 4,438 patients in the Central Islip Hospital 2,803 were foreign born and only 891 had been naturalized. In other words, 39.8 per cent. and 43.1 per cent., respectively, of the patients in these two metropolitan hospitals were aliens.

The average length of hospital residence is 9.85 years. Consequently, on the basis of the figures for 1912, the 9,241 aliens

$9,996,108. In 1903 this expenditure was $15,520,022. In 1913 it was $41,767,825.

The State's total expenditure for current expenses for the ten years from 1894 to 1903, inclusive, were $214,923,919.49. These expenditures for the ten years from 1904 to 1913, inclusive, were $357,141,269.23.

Some of this increase is due to the assumption by the State of new obligations. Canal and highway improvements are responsible for a great part of it. But whatever the causes, the State has reached a point where it must stop and take reckoning of its resources.

A STARTLING REVERSAL.

From 1893 to 1906 the receipts of the State mounted rapidly, due to the constant addition of new sources of indirect revenue. During the same period expenditures increased slowly. Consequently in 1906 the indirect receipts were $6,422,473 greater than the current governmental expenses of the State.

From 1906 to 1913, this condition of affairs has been reversed. Receipts have increased slowly and expenditures have risen with lightning speed. The maximum indirect revenue has been practically reached, but expenditures have continued to climb. For several years prior to 1906 the per capita revenue from indirect sources increased nearly four times as fast as the expenditures. Since 1906 the per capita expenditures have increased twice as fast as the indirect revenues.

At the present moment the State's expenditures, aside from the millions of fixed charges which the State must meet, have practically overhauled the indirect receipts. The Comptroller estimates that the revenues from indirect sources for next year will be 7 per cent. less than the indirect revenues of the current year.

In five years, if the present ratio of increase between receipts and expenses is maintained, the expenditures will be $4,000,000 greater than the indirect receipts. This of course means that the State will be compelled to raise by direct tax not only the money for its sinking fund but this additional $4,000,000. Furthermore, the Comptroller estimates that in five years on the present basis, the annual contributions necessary to maintain the sinking fund will have increased $6,500,000.

To sum up the situation I have figures before me which show that unless New York at once begins to retrench it will be compelled within five years to raise by direct taxation over $10,000,000 a year more than it does at the present time. This is not a theory, but a fact — a fact which must be ever present in preparing budgets and making appropriations.

There are certain expenditures fixed by law and ordered by the vote of the people of New York. These you cannot alter; the most you can do is to insist that the money you appropriate for these purposes is spent with wisdom and economy.

There is a wide field however, where in your discretion you can reduce the expenses of the State.

SOME COMPARATIVE FIGURES.

In making your appropriations it will be well to remember that while expenditures in the curative division of the general fund increased $934,036 from 1900 to 1906, they increased $1,662,869 from 1906 to 1912. That is to say, expenditures in this division mounted twice as fast in the second six years as they did in the first.

Expenditures in the agricultural division increased $328,092 from 1900 to 1906, and increased $1,063,848 from 1906 to 1912. In other words, expenditures in this division increased three times as much in the second six years as they did in the first.

Expenditures in the regulative division increased $226,535 from 1900 to 1906, and increased $1,218,317 from 1906 to 1912. Which indicates that expenditures in this division increased more than five times as much in the second six years as in the period from 1900 to 1906.

The increase for one year from 1912 to 1913 in the regulative division was $158,760, in the agricultural $330,359, and the curative $632,068.

Which means that the expenditure in the agricultural division increased as much in the last year as it did in the six years from 1900 to 1906, and that the increase in the expenditures of the curative division for the last year was 67 per cent. of the total increase for the six years from 1900 to 1906.

The requirements for sinking fund purposes were $1,518,578.70 in 1905. The expenditures for sinking funds during the year ending September 30, 1913, were $6,788,983. Under the law this increase could not be avoided.

During this same period, the other increases in expenditure amounted to $16,000,000. And these increases were due solely and simply to the legislative policy of the Government.

AN INVITATION TO EXTRAVAGANCE.

The existence of a large surplus from indirect revenues, and the abolition of the direct tax forestalled criticism of the State's expenditures. Departments, institutions and other interests came to the Legislature and secured appropriations which they could not have obtained, if a public burdened with a direct tax had been watching.

For instance, in 1906, after the increase in indirect revenues became known, appropriations began to increase by leaps and bounds. Thirty-nine special bills — local in their nature and carrying large appropriations — were enacted and a policy was adopted of making large appropriations for the construction of new buildings for charitable and hospital institutions.

At the time when the appropriations were made the members of the Legislature may have felt that the public interests required or justified the voting of these vast sums; but we have now reached a point where relief must be given to the overburdened taxpayer, and not a dollar should be appropriated which the interests of the people do not require. Unnecessary expenditures must be prevented; luxuries must be lopped off, sinecures abolished, and the public expenditures reduced to a sum determined only by the prudent needs and just obligations of the people of the State.

The appropriation of $190,000 from the general fund of the State last session to build a highway from Palenville to Twilight Park should not be followed as a precedent. This sort of legislation is vicious. The people of the State have voted $100,000,000 for good roads and that is the limit of justice.

Every county is entitled to its proper share of good roads. It can get no less by law; it should get no more by raids upon the general treasury.

OUR MANIFEST DUTY.

A general policy of economy must be observed on every hand.

No appropriation should be made which does not benefit the State as a whole. But, Statewide movements must, of course, have local beginnings.

No State subsidies should be provided for purely local purposes or purely local institutions.

No new activities or new functions involving appropriations, unless positively demanded by public welfare, should be undertaken by the State until such time as an ample surplus has been accumulated in the State Treasury.

No increase in expenditures should be sanctioned except for the purpose of securing greater revenues, compelling greater economy, conserving our natural resources or meeting some extraordinary public emergency.

No appropriations for the maintenance of departments and institutions should be made upon guesswork. They should be based upon actual figures and actual needs.

All appropriations should be for specific purposes and specified amounts.

Every appropriation should be minutely itemized so that not a dollar can be diverted from its lawful purpose.

Above all, appropriations must first be made for necessities. When necessities have been properly provided for, it will be time to consider whether there is any money left to spend upon luxuries.

NO SPECIAL FINANCIAL BILLS BEFORE GENERAL APPROPRIATIONS.

I shall feel compelled to veto any special appropriation which reaches me before the imperative appropriations for the necessary maintenance of the government have been made and examined.

Eighth:

That the United States provide a suitable attendant to accompany to his destination a deportable alien who is mentally unfit to travel alone.

These and such other recommendations as will suggest themselves to the Legislature, may assist Congress to a proper disposition of the problem of the alien insane.

New York is not an applicant for national charity. It is able and determined to discharge its duties as a State without assistance from any quarter.

New York is more than ready to care for its own, but it is reluctant to continue to assume the proper obligations of the National government.

I believe that the fairness of the American nation will incline Congress to take up the matter of the alien insane if the Legislature of New York brings it to the attention of Congress.

New York is acting as a shield and a melting pot for the United States, and the least that the nation can do to show a proper appreciation is to relieve New York of the burden of the alien insane.

New York is proud of the fact that it has not waited for the nation to come to the assistance of the unfortunate aliens in its hospitals for the insane. It is glad that its resources have permitted it to provide suitable care for the mentally afflicted, cut off from the friends and relatives of their native country. If the National government refuses to do justice to New York this State will continue to deal with its insane aliens with kindliness, patience and generosity. But the rest of the nation should not permit New York to bear a burden that is unjust and inequitable.

I shall call the attention of New York's representatives in Congress to the facts I am transmitting to the Legislature and shall request them to assist the Legislature in effecting a satisfactory disposition of this matter.

New York confronts a situation where it must spend $25,000,000 of its own money for those who are properly the charges of the National government.

The nation is too strong, and too just, to permit this situation to continue.

(Signed) MARTIN H. GLYNN.

III. The Secured Debt Tax Law. By proper amendments to this measure, many securities at present not taxable may be compelled to produce added revenues and bear their fair share of the State's expenses.

IV. Corporation Tax Law. The Comptroller will shortly submit amendments to the Corporation Tax Law which will overcome difficulties in interpretation and compel a more equitable enforcement of the law to the end that revenue from this source will be considerably increased. In this connection let me suggest that the Private Banking Law needs amendment so that small depositors shall receive better protection.

V. Distribution of Cost of Permanent Improvements. At present many institutional buildings, the extensions thereto, and other improvements of a permanent nature are paid for out of the current revenues of government. Steps should be taken to spread this cost over an extended period, through the issuance of special bonds, so that future taxpayers will be compelled to pay their fair share of these permanent benefits.

VI. A More Scientific Financing of State Institutions. A real study should be made of the maintenance of the State's hospitals and prisons. The purchase of supplies, and their use should be scrutinized with the greatest care. The State hospitals should be encouraged to utilize their lands for raising food stuffs. Our charity laws should be revised so that no patient who is able to pay for his maintenance can escape his just obligations.

VII. Recompense for the Alien Insane. A report of a special Commissioner shows that of the 32,599 inmates of State hospitals, more than 9,000 are not citizens of the United States. There is no reason why New York should be compelled to bear the expense of their maintenance simply because it is the Nation's receiving ground for foreign immigration. A demand should be made upon the Federal government for aid in deporting these aliens, or assistance in supporting them. In ten years — the average hospital residence — the cost of maintaining these helpless aliens amounts to $18,000,000.

VIII. The Canal Lands. There is a growing tendency to give abandoned canal lands to municipalities. This is poor business and worse morals. All the people of the State paid for these lands and all the people should receive some benefit from them. The canal lands shortly to be abandoned are estimated to be worth somewhere between half a million and a million dollars. The State should not relinquish its title to them without an adequate compensation. They should be sold for their full value — not given away.

IX. Abolition of Supply Bill. All grants of money should be contained in one appropriation bill. Under the budget system this should be easily effected. Those receiving appropriations from the State, have more and more each year ignored the plain purpose of the appropriation to provide funds for a single fiscal year, and have created obligations in excess of the amount appropriated, so that the Supply Bill, carrying such items has increased from $3,809,925.60 in 1907 to $5,709,331.66 in 1913. The Supply Bill is the State's pork-barrel bill. As an invitation to extravagance, it should be abolished.

X. Care in Appropriations. One cause for increased expenditures is found in the fact that interested people have presented arguments to the Legislature of more or less force, whereby they secured appropriations greatly in excess of the needs of the fiscal year, only to return the following year and ask a still larger appropriation, notwithstanding the fact that there were in the State Treasury large unexpended balances of the previous appropriation. By compelling the use of an appropriation for the payment of obligations incurred during the fiscal year for which the appropriation was made and for no other purpose, it is evident that these practices will cease and the yearly appropriations will represent the real cost of the support of the government. The return of unused appropriations to the Treasury must result in a considerable decrease in the total amount of the appropriations required for the coming year.

XI. Excessive Appropriations. A remedy for existing conditions is to be found in making appropriations conform to the actual cost of the support of the government. The history of appropriations made for institutions and for departments in a less degree, shows constant reappropriation of money which they have been unable to use. It must be evident to anyone that these excesses should not have been appropriated in the first instance. This is shown by any of the appropriations for the State hospitals. In 1912 the appropriations made for maintenance of the State hospitals were $6,798,666. The actual expenditures for maintenance were $6,458,924. By different schemes of shifting the expenditures which were not for maintenance so that they were charged against maintenance appropriations, $340,000 was used up and the Legislature of 1913 was asked and persuaded to make a deficiency appropriation for maintenance.

XII. Unnecessary Legislation. One of the great errors of modern thought is the notion that a people can be made permanently prosperous by legislation. Abuses may be remedied; wrongs may be righted by legislation. But the greatest right possessed by a free people and one with which legislation should not interfere, is that of pursuing without governmental interference their individual fortunes in a manner that preserves to each of the citizens that broad liberty of action within the law which does not infringe upon the rights of another. There is too much governmental activity, and too general a notion that difficulties and troubles essentially belonging to and inseparable from human nature can be removed by legal enactments. I strongly urge upon you, wherever possible in your judgment, the abolition or consolidation of departments or bureaus, rather than the extension thereof.

XIII. A Short Session. Long sessions are a drain upon the members of the Legislature, and a source of expense and disquiet to the State. Private considerations and public spirit both urge the Legislature to complete its important work with all possible expedition.

THE SINKING FUND.

In addition to the problem of economy, there is another question to which this Legislature should provide a satisfactory answer. State finance will not be placed upon a sound basis until some scientific disposition is made of the contributions to the sinking fund.

SQUEEZING THE TAXPAYERS OF TO-DAY.

The surplus in the sinking fund is of no advantage to the State; on the contrary it represents a serious and unnecessary drain upon the taxpayers of the present generation. The ultimate purpose of a sinking fund is to distribute the cost of permanent public improvements over an extended period. It should provide a means to make the taxpayers of the future share equally with the taxpayer of the present the expense of a lasting public benefit. The fact that there is a surplus in the sinking fund shows that the sinking fund is not fairly distributing its burden. It means that the men of to-day are paying more than their fair share of the cost of public improvements.

At a time when the entire Nation is complaining of the high cost of living it is not wise to allow an unfair discrimination against the present taxpayers of New York. An overburdened present should not be asked to pay the debts of the future.

A PREPOSTEROUS SITUATION.

Through mistakes in fixing tax rates, and increases in assessed valuation, several of the sinking funds show accumulations out of all proportion to what is just and equitable. In sinking fund No. 3, for instance, $21,000,000 worth of bonds have been issued in the last eight years. In that sinking fund to meet a principal of $21,000,000 we have piled up in eight years over $16,000,000, and the bonds still have 42 years to run. The taxpayers of the present have raised over $16,000,000 and left only $4,500,000 for the taxpayers of the next 42 years to provide. The tax rate was based upon a bond issue of $99,000,000, when only $21,000,000 have been issued.

This same unfair situation exists in nearly all the subdivisions of the sinking fund. During 1906, 1907 and 1908, through a mathematical error, we made contributions to the sinking fund for $78,000,000 worth of bonds which were not issued and never have been issued. All the money necessary to retire an issue of $21,000,000 of 3 per cent. bonds will be raised and in the State Treasury 33 years before it is needed, unless the State adopts some more scientific method of caring for its sinking fund.

It was certainly never intended that such an absurd and unjust situation should exist. The sinking fund must be placed upon a better basis.

NO RAID UPON THE SINKING FUND.

I am opposed to any raid upon the sinking fund. Constitutionally, the State could not, if it would, take over the sinking fund surplus for current expenses, and, even if it could, the spirit of sound finance would oppose molesting the protection which the laws give to investors in State bonds. Not a dollar should be drawn from the sinking fund; not a dollar can be used for the general support of government; not a single security should be touched. New York State bonds rank among the world's best securities, and should be kept in that enviable place. But no investor will object to a readjustment of contributions to the sinking fund which will relieve him, and every other taxpayer, of an unnecessary burden.

A PLAN FOR READJUSTMENT.

Various plans for this readjustment have been suggested and discarded in the past because they failed to consider the rights of the holders of State bonds. After conferences with State officials, financial experts, and large holders of State securities, I have found a way to readjust the sinking fund with satisfaction to all concerned. The plan is based upon the theory that it is entirely proper to consider part of the bonds as provided for in full, and to pro-rate contributions to the sinking fund for the remaining bonds over the period which these bonds still have to run.

This plan is approved by lawyers, bankers, and holders of State bonds, and I shall forward their letters of approval to the finance committees of both houses.

These lawyers and financial experts agree with me that a proper, legal, and equitable distribution of contributions to the sinking fund will save the taxpayers of the State over $2,000,000 a year, for many years to come, and, at the same time, protect the rights of bondholders and uphold the honor and credit of the State.

As I construe the Constitution, it directs the legislature to provide, by taxation, a sinking fund to meet the obligations, chargeable against it, as they mature. This the creditors of the State have a right to exact; this the taxpayers have the right to expect.

It is unnecessary for the interests of bondholders and unjust to the rights of taxpayers to maintain a tax rate which accumulates a sinking fund out of all proportion to the debt chargeable against it.

The policy I propose is still further urged by the provision of the Constitution that the sinking fund shall be used for no other object than the specific purpose for which it was created.

Because of the great importance of this subject, I urge it upon you for careful consideration and wise action at this session.

NO NEED FOR PESSIMISM.

There are other matters which I shall call to your attention in the near future. The question of State finances, however, is of such vital importance that I prefer not to cloud it with references to other problems.

Though this message places sober emphasis upon the State's financial condition, it is the emphasis of resolution and not of disquiet. There is cause for action, but not for alarm; for earnestness, but not for pessimism.

New York is spending money lavishly, but its magnificent credit is unimpaired. It is attempting, and performing great things, in public improvements, in charitable works, in every field of social and economic advance. The State is virile and rich, and, for that very reason, it richly deserves prudent government.

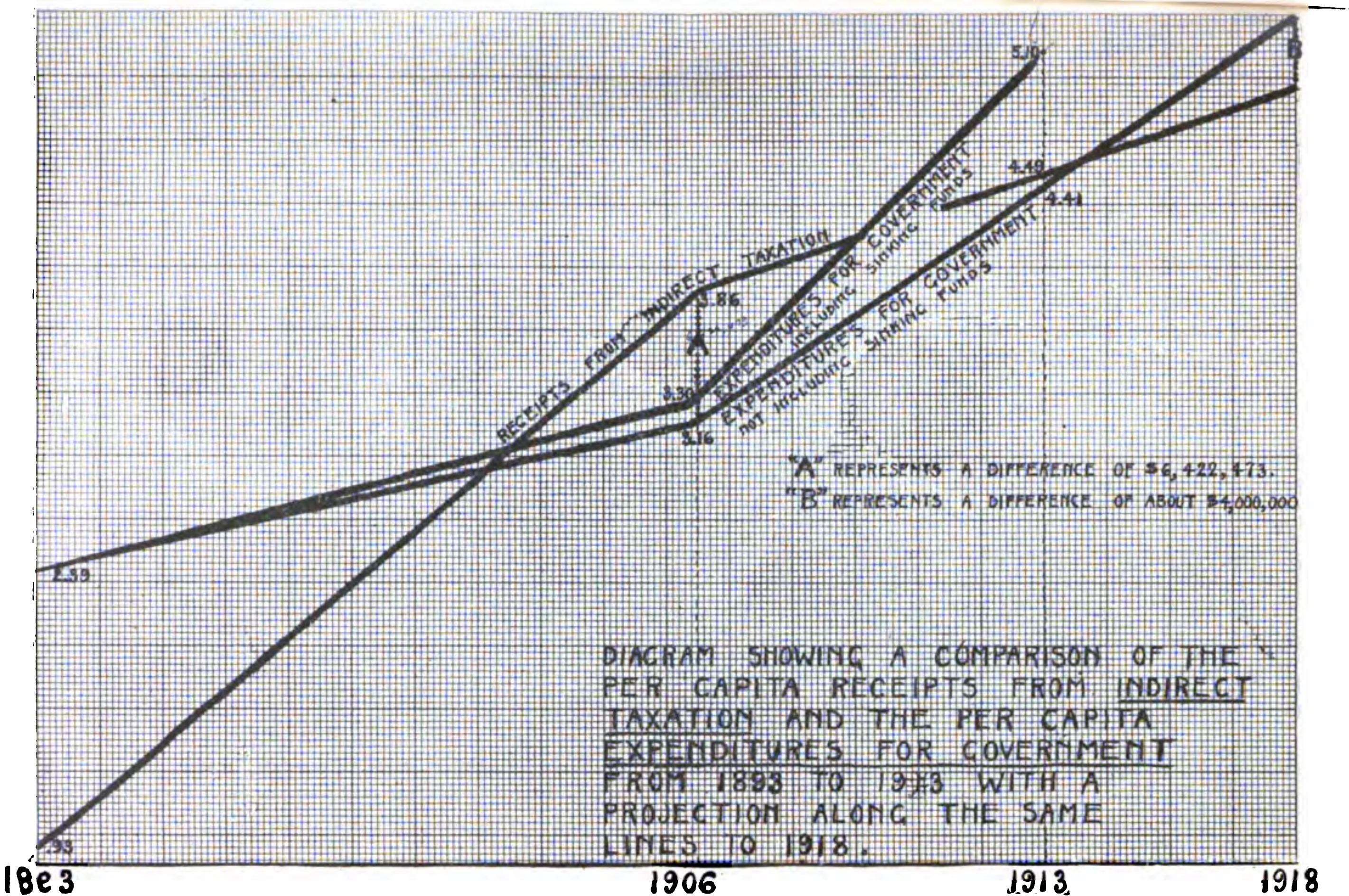
MARTIN H. GLYNN.

[I append hereto a summary of the State's finances, of receipts and expenditures for 1913, to which your attention is respectfully called. I further append charts illustrating the increase in expenditures between 1893 and 1913.]

THE TRANSACTIONS OF THE TREASURY DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1913, ARE REFLECTED IN THE SUMMARIZED STATEMENT FOLLOWING:

Balance of cash on hand September 30, 1912		$35,882,937 47
Receipts (including transfers between funds):		
General fund:		
Direct State tax and special tax for court expenses	$11,154,114 25	
Excise tax	9,280,681 65	
Corporation tax	10,910,529 13	
Organization of corporations	455,512 50	
Transfers (inheritance tax)	12,724,236 86	
Stock transfer (stamp tax)	2,927,810 88	
Secured debt tax	1,167,476 04	
Mortgages	1,647,710 82	
Motor vehicles	1,267,832 95	
Other sources	3,914,048 16	
Total general fund	$55,449,953 24	
Canal fund	32,087,433 44	
Highway improvement fund	12,123,357 73	
Saratoga Springs State Reservation fund	385,000 00	
Palisades Interstate Park fund	139,032 59	
Trust funds	1,064,217 57	
Total receipts		101,248,994 57
		$137,131,932 04
Expenditures (including transfers between funds):		
General fund:		
For the support of State government, maintenance, construction and betterments of institutions, etc., and maintenance and repairs of canals and highways	$42,937,810 91	
Canal debt sinking funds	4,442,263 33	
Highway debt sinking fund	2,237,590 67	
Palisades Interstate Park debt sinking fund	139,032 59	
Saratoga Springs State Reservation for debt and interest	131,100 00	
Total general fund	$49,887,797 50	
Canal fund	27,213,579 48	
Highway improvement fund	15,947,179 92	
Saratoga Springs State Reservation fund	284,880 76	
Palisades Interstate Park fund	100,000 00	
Trust funds	1,547,937 15	
Total expenditures		94,981,374 81
Balance of cash on hand September 30, 1913		$42,150,557 23

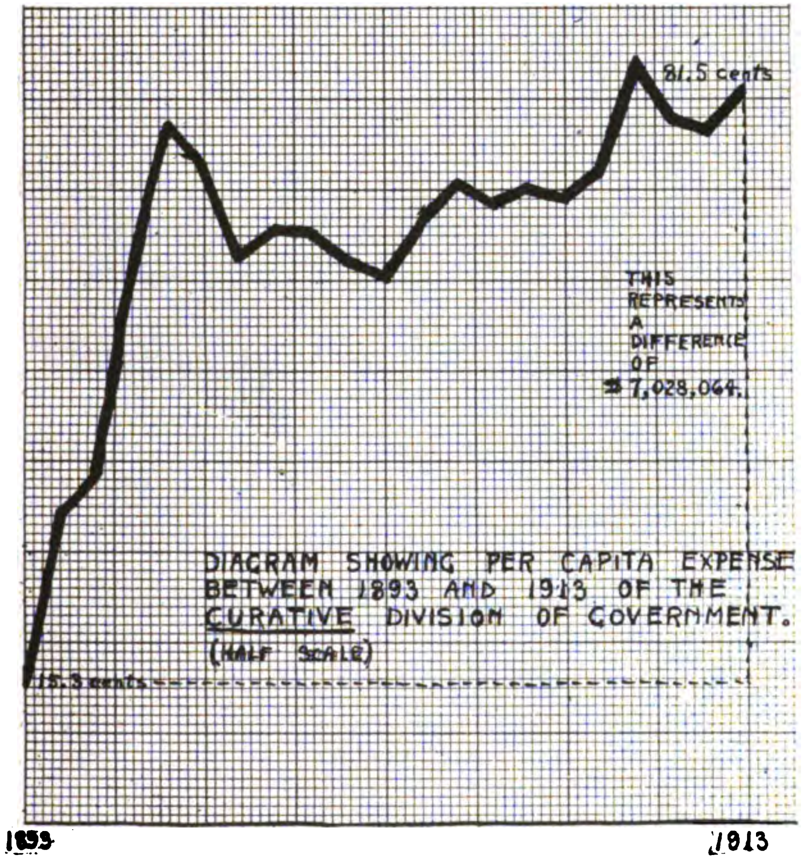
CHART NO. 1.



This diagram illustrates how the expenses of State government have overhauled the indirect revenue from all sources. In five years, if the present rate of increase is maintained, expenditures, exclusive of sinking fund contributions, will exceed indirect revenue by $4,000,000. Including sinking fund contributions, expenditures will exceed indirect revenue by $10,500,000.

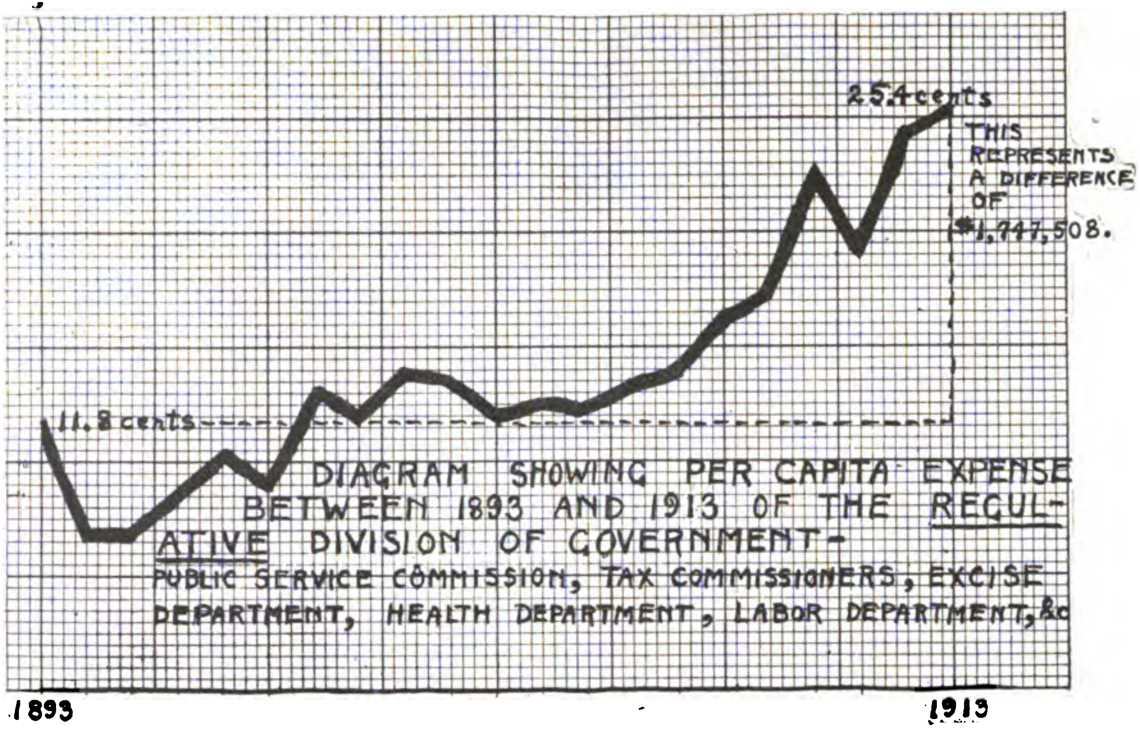
UNIV. OF MICH.

CHART NO. 2.



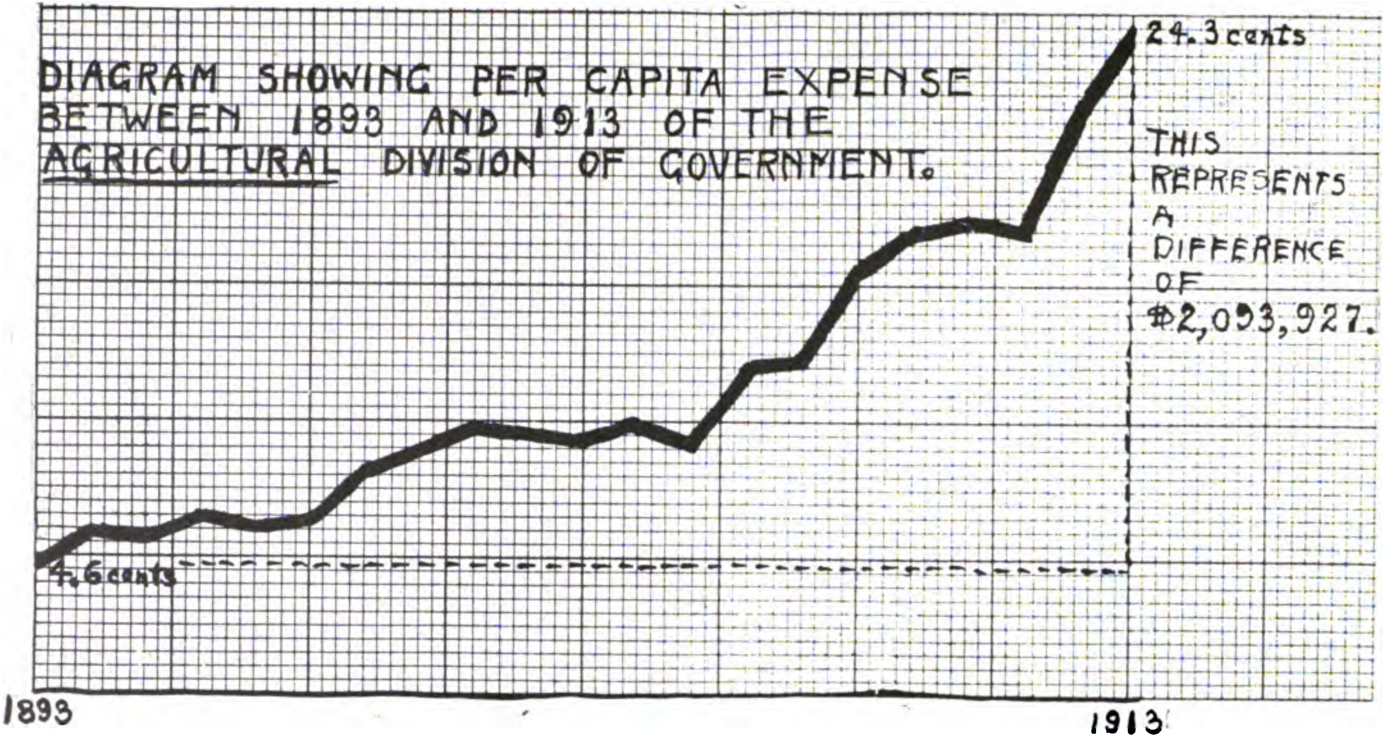
This illustrates the increase from 1893 to 1913 in the annual per capita expenditures of the curative division of government, which includes State hospitals and the maintenance and care of the insane.

CHART NO. 3.

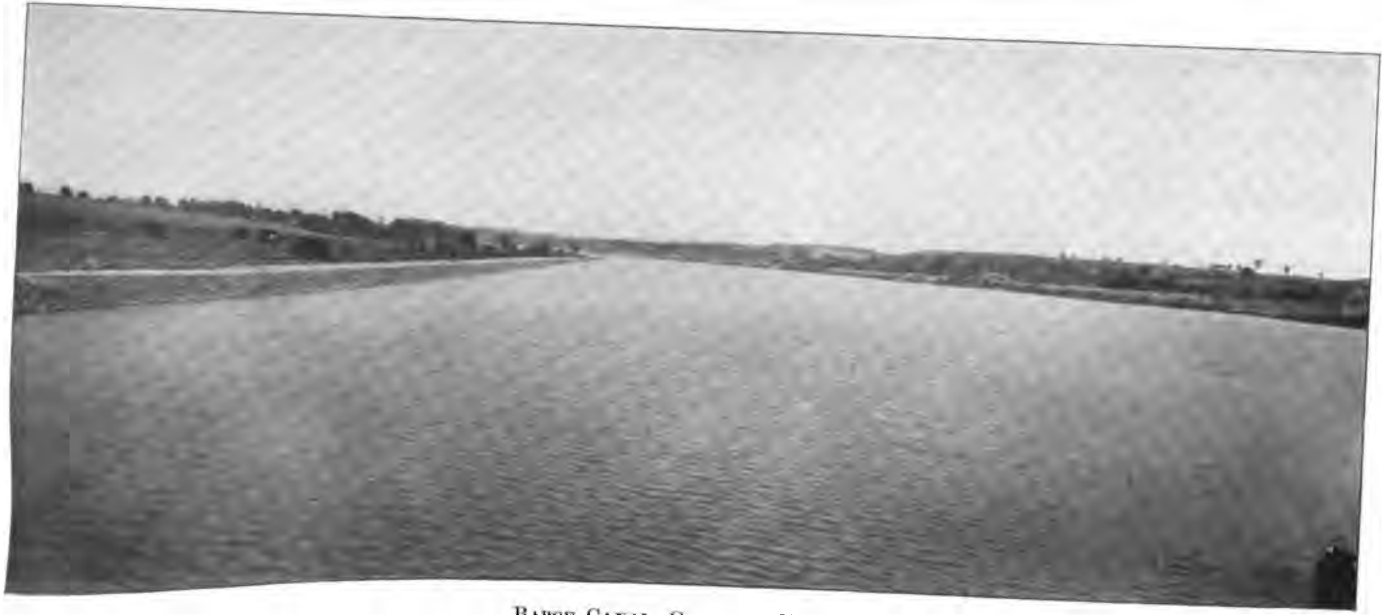


This illustrates the increase from 1893 to 1913 in the annual per capita expenditures of the regulative division of government, which includes the Public Service Commission, State Board of Tax Commissioners, the Departments of Excise, Health, and Labor, etc.

CHART NO. 4.



This illustrates the increase from 1893 to 1913 in the annual per capita expenditures of the agricultural division of government, which division includes the Department of Agriculture, distribution for the promotion of agriculture, agricultural education, etc.



Barge Canal, Contract No. 76.
View of the Barge canal in the vicinity of Newark.

391 of the Laws of 1909. In this report I called the attention of the Legislature and the people of the State to the actual conditions as existing in connection with these authorized improvements, believing that such facts as were then discussed by me in connection with this work should properly be placed before the people at that time. The conclusion arrived at as a result of my investigation and study of the conditions existing was set forth in that report and, in effect, was that the actual cost of construction for the work contemplated at the time of the preparation of the 1903 estimate and the cost of engineering supervision in connection therewith would be performed approximately within the amount estimated, covering similar sections as were considered in the 1903 estimate, but that the total cost of the entire project, that is, all expenses incidental to this work, including land and water damages, could not be borne by the $101,000,000 originally appropriated. Emphasis was laid on the fact that such increase in the cost was not due to any cause or condition of affairs within the control of the State Engineer, but that the excess in the cost of this undertaking would be due mainly to the payments which the State would be obligated to make in settlement on account of the appropriation of lands and in the payment of damages by reason of the confiscation of water powers and riparian rights.

Since the making of this report to the Legislature of 1913, comment has been made relative to the figures and facts therein contained and presented for the consideration of the Legislature, particular stress having been laid by some through the public press on my statements that this work could not be completed in its entirety within the original appropriation, which conclusion then arrived at I wish to again repeat.

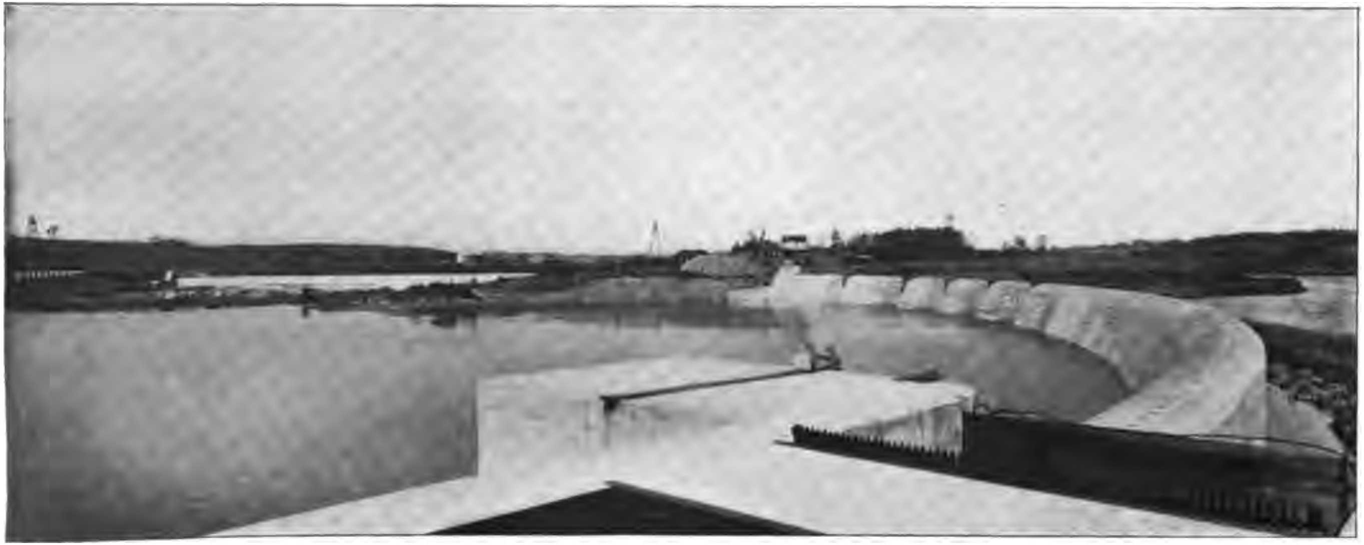
There was introduced in the Assembly on December 10, 1913, a resolution, requesting for the information of the Legislature certain data in connection with the Barge canal improvement, and while such resolution did not become effective and such action was subsequent to the closing of the fiscal year ended September, 1913, I desire to embody in this report data with reference to the Barge canal improvement sufficient to place before the Legislature and the people the exact status of this work, and have considered all matters as in effect on December 1, 1913. Such modifications as may have occurred in the various contracts during the month of December, 1913, have not been such as will materially affect the complexion of this report. In order to properly present this information it will be necessary to incorporate the statistics covering the fiscal year ended September 30, 1913, also data embodied in my report to the Legislature of 1912, together with data having a bearing on this work for the months of October and November, 1913.

In reporting to the Legislature on this matter, it is with due deference to my predecessors in office and those who have been connected with this work prior to my administration, and my statements as embodied in this report are not intended to be in the light of a criticism of those who have heretofore been associated with this project, but are simply statements of fact. It is therefore pertinent that I should refer to the report submitted to the Legislature in 1903 by former State Engineer Bond in answer to questions embodied in a resolution adopted by the Assembly on February 10, 1903. This report contains answers to certain questions then propounded, tending to show that $101,000,000 would be sufficient to defray the entire expense incurred in connection with the Barge canal project, on the basis that the State of New York would of necessity have to defray the entire expense of such proposed improvement. Therefore there will be included in this report certain information submitted in 1903, also information along the lines of the subject matter of the resolution introduced in the Assembly on December 10, 1913, and other data deemed pertinent to the question at issue.

In the information submitted to the Legislature in 1903 it was stated that due allowance had been made to cover the increased cost of materials and labor between the time of the original estimate in 1901 and the time of submitting the additional information in 1903.

It therefore appears proper to call attention to the fact that since the authorization or making of the appropriation in 1903 there has been a still further increase in the cost of materials and in the price of labor.

The Legislature was advised that provision had been made for all necessary bridges over the proposed canal and statement was



Barge Canal, Contract No. 14.
View from the eastern end of Crescent dam, showing the whole length of the structure.

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furnished showing the number of each type which would be required. The estimated cost for the construction of highway bridges was included in the general estimate of cost for construction and therefore no attempt has been made to separate this item of expense in the consideration of the question at this time. However, since the enactment of the original Barge Canal Law it has been necessary to provide bridges of a different type over the Oswego canal, in order to conform to the requirements of legislative enactment, in that the bridges erected over such canal should be of a movable type or of a type convertible into some form of movable bridge, so as to provide unlimited clearance. In order to provide such structures it has therefore been necessary to increase the expense of the same above what could have been originally contemplated for simply an ordinary structure. The demands of highway traffic have also made necessary the construction of bridges of greater capacity than were originally contemplated, which has tended to increase the cost of bridges. The number of railroad bridges which it was stated in 1903 would be required was twenty-seven. It is now found that forty-five new bridges must be constructed and four bridges raised, these figures not including bridges used for both highway and railway traffic.

The estimated cost in 1903 for constructing dams in the Mohawk and Seneca rivers, the Oswego river and the Hudson river between Troy and Fort Edward was $3,734,570, and the cost of dams necessary for storage purposes, $2,769,096, making the total estimated cost for the construction of dams, $6,503,666. Practically all of these structures have been completed or are now in such a state of completion that a more or less definite figure can be given as to their probable cost, which figure is given at $6,427,095, as the cost of dams in rivers and for storage purposes. This figure does not include any allowances for appropriation of lands or payment for damages for any causes whatsoever.

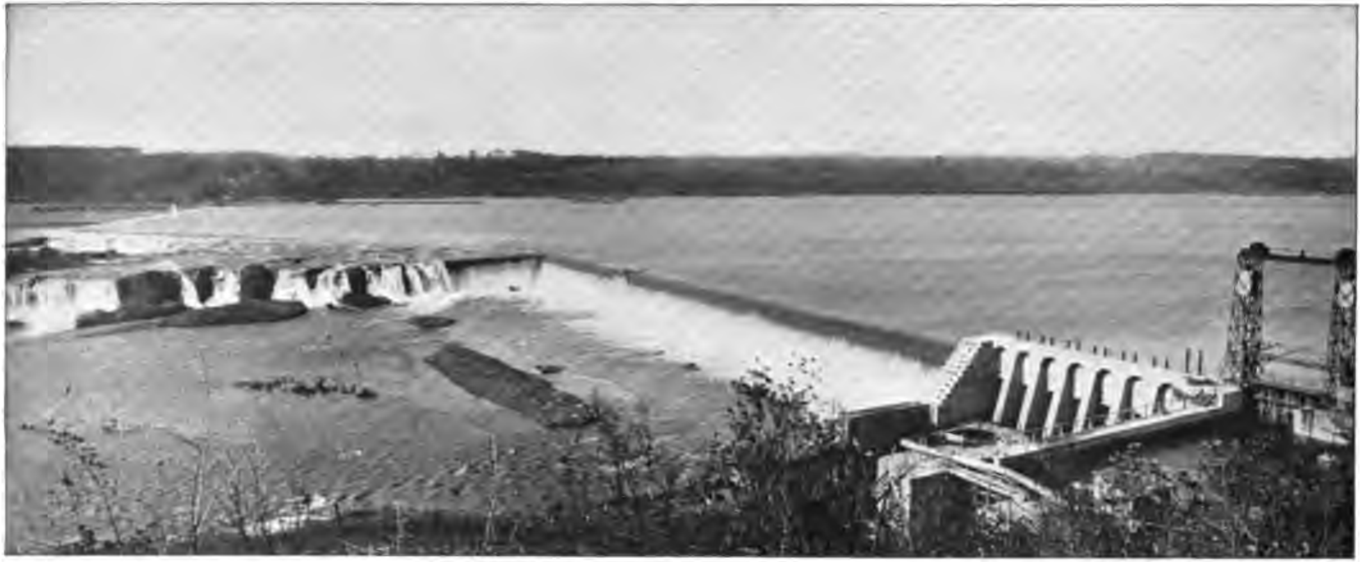
In the 1903 estimate no provision was made for damages to riparian owners, except along the Oswego river, where the sum of $188,500 was estimated as being sufficient for this purpose. Claims have been filed against the State covering the appropriation or confiscation of water powers or the destruction of water rights amounting to over $28,000,000, and in one case alone —

that of the Fulton Light, Heat & Power Company on the Oswego river — the claimant was awarded the sum of $388,000, including interest, by reason of the appropriation of their water rights. It is therefore seen that the amount estimated for this item alone is doubled in the case of one award. The gross estimated cost in 1903 for land damages was placed at $3,738,843, toward the payment of which it was estimated that $1,966,391 would accrue from the sale of abandoned canal lands, making the net estimated cost of right of way $1,772,452. These amounts, it was stated, were considered liberal figures in view of the prices on real estate governing at that time. That this figure was not sufficient is shown by the fact that payments have already been made aggregating approximately $5,000,000, covering settlements on account of the appropriation of lands, this not including settlements with railroads amounting to approximately $3,500,000.

It is evident that the amounts paid by the State in settlement for lands and water powers appropriated will greatly exceed the amount estimated for these purposes in 1903. To offset this expenditure the State will become the owner of lands and waters, the value of which cannot at the present time be estimated.

There was added to the general estimate of 1903 the sum of $4,365,454 to cover estimates which might prove erroneous by reason of unforseen difficulties being encountered when the work was actually being carried on or on account of defective foundations or conditions encountered in progressing the work, which "the utmost engineering skill might not be able to determine in advance." The total estimated cost therefore was fixed at $101,000,000, this including an item of $1,403,307 to cover work necessary between Troy and Waterford and work from Tonawanda to Buffalo in the event of such work being included in the Barge canal project.

Such was the information before the Legislature for consideration at the time of the enactment of chapter 147 of the Laws of 1903, and this information, considered with the data embodied in my report of 1912, evidently has been the basis of conclusions arrived at in the current criticism. I shall therefore place before the Legislature a detailed and concise statement covering the status of the Barge canal improvement as existing at the present



Barge Canal, Contract No. 14.

View of Vischer's Ferry dam, showing the sections across each of the two river channels and the section on the intervening island; also the lock at the farther end.

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time, in which will be covered the question of contracts awarded, alterations to contracts, extra or unspecified work orders, contracts completed, contracts suspended, the cost of engineering, the cost of land damages and water power damages, and miscellaneous expenses incidental to this undertaking.

All of the data embodied herein does not pertain directly to the question of construction or engineering, and it has therefore been necessary to obtain certain information from other departments of the State government having to do with this project.

The first Barge canal contract was awarded in 1905, and from that time up to the time of my taking office on January 1, 1911, contracts had been placed in effect amounting to $72,550,222, on which contracts work had been completed to the amount of $26,088,037. To December 1, 1913, work had been contracted for amounting to $77,800,569, of which there had been completed work amounting to $64,153,809. The increase, therefore, in the amount of work placed under contract between January 1, 1911, and December 1, 1913, was $5,250,340, and the total amount of work completed during this period of time, $38,065,772, these figures including the amount of contracts as affected by supplemental alterations and payments made on account of extra or unspecified work orders. These figures, however, do not include the sum of $461,241, the amount of work performed in reconstructing highways destroyed or damaged by reason of Barge canal improvement, nor the sum of $185,506.69, the amount of work performed under special direction by the Superintendent of Public Works at the sloop lock, Troy, and in constructing a small lock at Vischer's Ferry, the engineering work having been performed by the State Engineer. Therefore the total amount of construction work performed under the supervision and inspection of the State Engineer amounts to $64,800,556.

It must be realized that as work of this magnitude progresses certain unforeseen difficulties are encountered and conditions met which were not known and could not have been foreseen at the time of the preparation of the original estimates, regardless of the care with which such preliminary studies and estimates have been made. Delays have been experienced in progressing the work authorized in connection with this improvement, due principally to three causes: first, interference by reason of railroad crossings encountered along the line of the canal; second, interference with Barge canal work by reason of the necessity of maintaining navigation on the present canal system, and third, failure on the part of certain contractors to comply with the condition of their contracts.

The first difficulty, namely, that of interference by reason of railroad crossings, has been due to the fact that contracts crossed by railroad lines were entered into prior to my taking office on January 1, 1911, in which no provision was made for new structures or for placing the contractors in possession of the sites of their contract at such railroad crossings. The second interference was due to the fact that, had the original plans as prepared and the contracts as let been carried into effect, navigation on the present canal system would have been destroyed. The third is due to financial difficulties encountered by certain of the contractors and their inability to finance their contract undertakings. It has also been necessary as the work progressed to make alterations to some of the contracts in order to meet unforeseen conditions encountered and it has been necessary to issue extra work orders covering items not directly related to the work included in the original contract. Regardless of how slight were the changes in plan to meet these unforeseen conditions, it was necessary to provide for such changes by the issuance of extra work orders or alterations along the lines as prescribed in the Barge Canal Law.

On several contracts where the cause of interference was a railroad crossing, after giving due consideration to all the conditions attendant upon such contracts, the Canal Board, in view of the inability of the State to place the contractor in possession of the entire site of his contract and the contract time having expired, has cancelled such contracts, eliminating the balance of the work remaining to be performed thereunder. This action has been taken with the idea in view of minimizing the claims for damages which might be recovered against the State, should the contractor be compelled to maintain his plant and organization on the site of the work until it becomes possible for the State to deliver the entire site of the contract.

Similar action has also been necessary with respect to other

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contracts where the conduct of the work along the lines indicated on the original plans would have destroyed navigation on the present canal system, which would be contrary to the laws of the State.

In the case of the third class of delays, *i. e.,* the failure of contractors to comply with the conditions of their contracts due to financial or other difficulties on their part, it has been necessary to cancel the contracts, readvertise the work remaining to be done and execute new contracts embracing such uncompleted work, relying on the 10 per cent retained from the amount of work actually performed by the original contractor and the amount of the surety bonds executed on account of such particular contracts to reimburse the State for any additional expense which might be entailed by reason of such cancellation and reletting.

There are given below tables setting forth the status of the Barge canal work on December 1, 1913, with respect to contracts which have been entered into, alterations and extra work orders affecting the same, contracts completed, contracts cancelled and contracts upon which the contractors have defaulted. These tables show the amounts of the original contracts as affected by supplemental alterations, also the amount of work performed.

Table I, given below, shows all Barge canal contracts under way on December 1, 1913, both those authorized by chapter 147 of the Laws of 1903 and by chapter 391 of the Laws of 1909.

TABLE 1.

Contracts under way.

Improvement of Erie, Champlain and Oswego Canals.

Contract No.	Canal.	Section.	CONTRACTOR.	Date of contract.	Original date to be completed.	Revised date to be completed.	1903 estimate.	Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.	Last monthly estimate.	Extra work.	Total work to December 1, 1913.
			A. CONTRACTS UNDER ORIGINAL TERMS.										
12	Erie	6-7	James Stewart & Co	9-22-'07	11- 1-'11	12-31-'13	$2,832,772	$3,082,560	$3,391,716	$3,513,463	$2,897,010	$329	$2,897,339
14	“	1-2-3	Acme Engineering and Contracting Co	9-10-'07	4- 1-'12	4- 1-'12	2,926,368	2,875,570	2,935,763	2,985,225	2,591,270	73,193	2,664,463
14-A	“	1	John Henkes	10-26-'12	5-15-'13	1- 1-'14	0	4,765	4,318	4,046	3,560	0	3,560
20-B	“	3	S. Pearson & Son, Inc	8- 2-'09	12-31-'13	12-31-'13	1,110,000	848,540	933,194	1,032,210	892,480	1,421	893,901
20-C	“	3	American Pipe & Construction Co	8-19-'09	12-31-'13	12-31-'13	747,000	570,600	585,720	607,035	651,470	3,829	655,299
20-D	“	2-3	American Pipe & Construction Co	8-18-'09	12-31-'13	12-31-'13	2,957,015	2,260,000	2,681,040	2,726,340	1,190,320	32,827	1,223,147
22	“	6-7	M. Fitzgerald	9-24-'10	4- 1-'11	12- 1-'13	130,374	107,126	110,268	127,937	82,520	2,310	84,830
22-A	“	7	Lupfer & Remick	8- 8-'12	12- 1-'12	11- 1-'13	0	24,916	27,099	27,099	21,900	0	21,900
23	“	9	Millard & Lupton Co	8-18-'09	2- 1-'13	2- 1-'13	1,693,035	2,166,600	1,887,036	1,824,389	1,194,430	2,601	1,197,031
24	Champlain	2	Kingsbury Construction Co	11- 1-'11	4-30-'12	1- 1-'14	30,300	46,692	44,368	44,368	38,810	0	38,810
29	Erie	4	Maryland Dredging & Contracting Co	4- 3-'09	12-31-'11	12-31-'12	745,377	812,350	683,714	691,250	503,020	7,425	510,445
30	“	4	Acme Engineering & Contracting Co	7-16-'09	12-31-'12	12-31-'12	2,288,631	2,650,500	2,591,666	2,681,761	2,028,500	1,053	2,029,553
35	Oswego	1	Gilmour, Horton, Allen Co	9-16-'07	8-15-'11	8-15-'11	649,575	752,760	739,261	723,632	669,780	3,374	673,154
37	“	1	Henry P. Burgard	12- 9-'10	5- 1-'14	5- 1-'14	2,032,493	1,992,220	2,323,998	2,500,119	1,961,460	0	1,961,460
39	“	....	James Stewart & Co	4-15-'10	12-31-'12	12-31-'13	335,713	972,900	1,048,674	1,047,786	447,360	0	447,360
43	Erie	5	M. A. Talbott Co	10-15-'09	5- 1-'13	5- 1-'13	1,952,069	1,529,885	1,320,560	1,448,985	734,270	4,915	739,185
44	“	5	Scott Bros	1- 8-'10	7- 1-'13	7- 1-'13	1,640,352	1,926,093	1,748,679	1,730,867	1,213,220	844	1,214,064
48	“	8	Crowell-Sherman-Stalter Co	12-29-'10	1- 1-'14	1- 1-'14	1,181,817	1,626,811	1,701,671	1,679,266	1,320,800	6,162	1,326,962
49	“	8	American Pipe & Construction Co	2-21-'10	5- 1-'12	5- 1-'14	776,730	765,679	750,279	744,342	644,180	5,964	650,144
50	“	5	Buffalo Dredging Co	9-23-'10	10- 1-'13	12-31-'14	1,016,328	1,076,000	963,415	971,769	625,490	1,270	626,760
51	“	5	Alto Construction Co	12-23-'10	5- 1-'14	5- 1-'14	252,410	424,710	389,842	400,227	233,980	5,302	239,282
56	Champlain	2	Flood & Van Wirt	9-26-'12	9-26-'14	9-26-'14	331,350	317,638	319,956	361,746	259,370	744	260,114
57	Erie	6	N. Y. State Dredging Corporation	8- 6-'12	8-15-'13	7-31-'14	111,071	85,625	93,596	93,596	74,160	0	74,160
62	“	10	I. M. Ludington's Sons, Inc	8-11-'10	5- 1-'13	12-31-'13	2,784,802	2,151,470	2,347,836	2,662,645	2,723,760	13,708	2,737,538
63	“	9	H. S. Kerbaugh, Inc	6- 3-'10	12-31-'12	12-31-'13	2,353,463	2,184,083	1,990,043	2,661,377	2,828,900	366,035	2,694,935

64	"	10	Empire Engineering Corporation	8- 6-'08	1-31-'12	1-31-'12	1,849,019	1,207,930	1,290,492	1,339,266	1,094,190	108	1,094,298
65	"	10	Maryland Dredging & Contracting Co	3-26-'13	12-31-'14	12-31-'14	650,482	1,131,523	1,000,098	1,000,098	370,310	0	370,310
67	"	10	Larkin & Sangster	9- 3-'10	5- 1-'13	1- 1-'14	1,202,794	1,290,880	1,149,401	1,161,543	1,020,230	15,454	1,035,684
77	"	8	The T. A. Gillespie Co	12-23-'10	5- 1-'13	12-23-'13	1,759,216	1,790,672	1,652,148	1,716,891	1,611,700	46,671	1,658,371
82	"		Groton Bridge Co	12- 7-'10	11- 1-'11	11- 1-'11	18,954	27,235	28,841	28,841	21,320	0	21,320
87	"	4	P. B. McCaghey	2-17-'13	8- 1-'13	11- 1-'13	0	10,900	11,202	11,202	11,060	0	11,060
89	"	8	Owego Bridge Co	5-28-'12	4- 1-'13	4- 1-'13	38,928	65,116	59,616	59,616	28,930	0	28,930
90-A	Oswego	1	Lupfer & Remick	8- 8-'12	5- 1-'13	10- 1-'13	6,830	64,840	64,020	64,020	40,930	0	40,930
91	Erie	1	The Hollington Company	1- 5-'11	9- 1-'11	9- 1-'13	24,807	44,600	42,940	44,985	42,900	0	42,900
92	Erie, Champlain		MacArthur Bros. & Lord Electric Co	2-17-'13	5- 1-'15	5- 1-'15	326,701	1,244,940	1,178,976	1,178,976	49,880	0	49,880
93	Erie, Oswego		MacArthur Bros. & Lord Electric Co	8-12-'13	5- 1-'15	5- 1-'15	110,505	393,701	379,693	379,693	2,700	0	2,700
94	Erie	8-11	MacArthur Bros. & Lord Electric Co	2-17-'13	11- 1-'14	11- 1-'14	124,777	461,300	433,381	433,381	25,180	0	25,180
100	Erie, Oswego		W. J. Burns Company	9-17-'13	10- 1-'14	10- 1-'14	58,924	181,923	179,061	179,061	0	0	0
101	Erie	6	Barrally & Ingersoll	8- 8-'12	9- 1-'13	9- 1-'13	24,468	44,599	40,639	40,984	24,220	941	25,161
102	"	7	Lupfer & Remick	2-20-'13	7- 1-'13	10- 1-'13	19,911	25,035	25,993	25,993	11,810	0	11,810
103	Oswego	1	Barrally & Ingersoll	12-10-'12	12- 1-'13	12- 1-'13	18,618	185,655	197,995	197,995	42,770	0	42,770
104	"	1	R. B. Murdock	3- 5-'12	12-31-'12	7- 1-'13	14,059	45,580	39,370	39,370	36,610	0	36,610
105	Erie	9-10	Skene & Richmond	4-19-'12	5- 1-'13	8-31-'13	158,800	253,010	258,710	259,355	246,640	0	246,640
107	"	4	Jackson L. Richmond	2-19-'13	5- 1-'14	5- 1-'14	27,328	124,471	127,707	127,707	6,950	0	6,950
108	"	8	I. M. Ludington's Sons	10-17-'13	5- 1-'14	5- 1-'14	30,879	99,341	94,394	94,394	4,370	0	4,370
114	"	1	F. W. Leonhard	10- 7-'13	5- 1-'14	5- 1-'14	0	36,327	35,504	35,504	0	0	0
			Totals				$37,345,045	$39,985,671	$39,903,893	$41,710,355	$30,024,720	$596,550	$30,621,270

* B. RELET CONTRACTS ON BASIS OF NEW PLANS TO MEET UNFORESEEN CONDITIONS. (*See* TABLE VII.)

8-A	Erie	2	The Foundation Co	7- 6-'12	7-15-'14	7-15-'14	$1,255,169	$883,363	$799,399	$978,303	$383,320	$1,452	$384,772
27-A	Champlain	2	Holler & Shepard	12- 1-'10	5- 1-'12	5- 1-'12	1,177,024	409,455	449,499	486,464	365,070	29,923	394,993
			Totals				$2,432,193	$1,297,818	$1,248,898	$1,464,767	$748,390	$31,375	$779,765

† C. RELET CONTRACTS, ON WHICH ORIGINAL CONTRACTORS DEFAULTED. (*See* TABLE IX.)

10-A	Oswego	1	The T. A. Gillespie Co	12-14-'11	9- 1-'12	9- 1-'12	$1,157,710	$103,058	$106,738	$174,514	$162,350	$1,745	$164,095
10-B	"	1	Oswego Construction Co., Inc.	3- 4-'12	12- 1-'13	12- 1-'13		515,014	491,295	500,213	502,910	4,865	507,775
42-A	Erie	5	Grant Smith & Co. & Locher	2-24-'13	1- 1-'15	1- 1-'15	1,609,937	1,033,038	1,014,672	1,014,672	323,860	0	323,860
70-A	Champlain	1	Central Dredging Co	10-22-'12	12- 1-'15	12- 1-'15	232,500	790,488	759,159	759,159	101,010	0	101,010
71-A	"	1	P. McGovern & Co	1-16-'13	5-15-'15	5-15-'15	911,000	1,017,625	1,217,016	1,286,389	465,650	0	465,650
72-A	"	1	James Stewart & Co., Inc.	3-27-'13	5- 1-'16	5- 1-'16	1,496,599	1,396,585	1,534,603	1,534,603	572,890	0	572,890
			Totals				$5,457,746	$4,855,838	$5,123,483	$5,269,550	$2,131,700	$6,610	$2,138,310

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* The amount of work performed under the terms of original contracts Nos. 8 and 27 amounted to $1,314,311.

† The amount of security held by the State, consisting of retained percentages and surety bonds, to be applied to the increased cost, due to the defaulting of the original contractor and the reletting of the work on contracts Nos. 10, 42, 70, 71 and 72, is approximately $840,000. The amount of work performed under original contracts Nos. 10, 42, 71 and 72 prior to cancellation amounted to $2,830,494. The apparent cost of the work embraced in the sections covered by these contracts is therefore approximately $7,260,044.

TABLE I—*Concluded.*

Improvement of Cayuga and Seneca Canal.

Contract No.	Canal.	Section.	CONTRACTOR.	Date of contract.	Original date to be completed.	Revised date to be completed.	1909 estimate.	Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.	Last monthly estimate.	Extra work.	Total work to December 1, 1913.
A	Cayuga and Seneca	1	Scott Bros.	12-30-'10	5- 1-'13	10- 1-'13	$451,270	$393,133	$357,627	$376,233	$319,760	$1,765	$321,525
B	" "	1	Crowell-Sherman-Stalter Co.	12-29-'10	12- 1-'14	12- 1-'14	2,192,388	1,832,550	1,448,550	1,409,318	982,490	0	982,490
C	" "	1	Larkin & Sangster	1-11-'13	1-15-'16	1-15-'16	767,382	1,140,872	1,187,047	1,189,246	365,970	0	365,970
E	" "	1	Cleveland & Sons Co.	1- 7-'13	1- 7-'15	1- 7-'15	572,550	319,666	347,216	352,906	42,120	0	42,120
H	" "	1	N. Y. State Dredging Corporation	12-22-'11	1- 1-'13	1- 1-'13	0	178,237	179,769	225,001	217,360	0	217,360
I	" "	1	Central Dredging Co.	9-23-'12	3- 1-'14	3- 1-'14	0	304,330	215,639	215,639	165,900	300	166,200
			Totals				$3,983,590	$4,168,788	$3,735,848	$3,768,343	$2,093,600	$2,065	$2,095,665

SUMMARY, TABLE I.

SUBDIVISION.	1903 estimate.	Apparent cost of work to be performed on contracts, as affected by alterations.	Amount of work done.
	Erie, Champlain and Oswego Canals.		
A	$37,345,045	$41,710,355	$30,621,270
B	2,432,193	2,779,078	2,094,076
C	5,457,746	7,260,044	4,968.804
Totals	$45,234,984	$51,749,477	$37,684,150
	Cayuga and Seneca Canals.		
	1909 estimate. $3,983,590	$3,768,343	$2,095,665

Table II embodies a statement relative to contracts completed in their entirety on or before January 1, 1911.

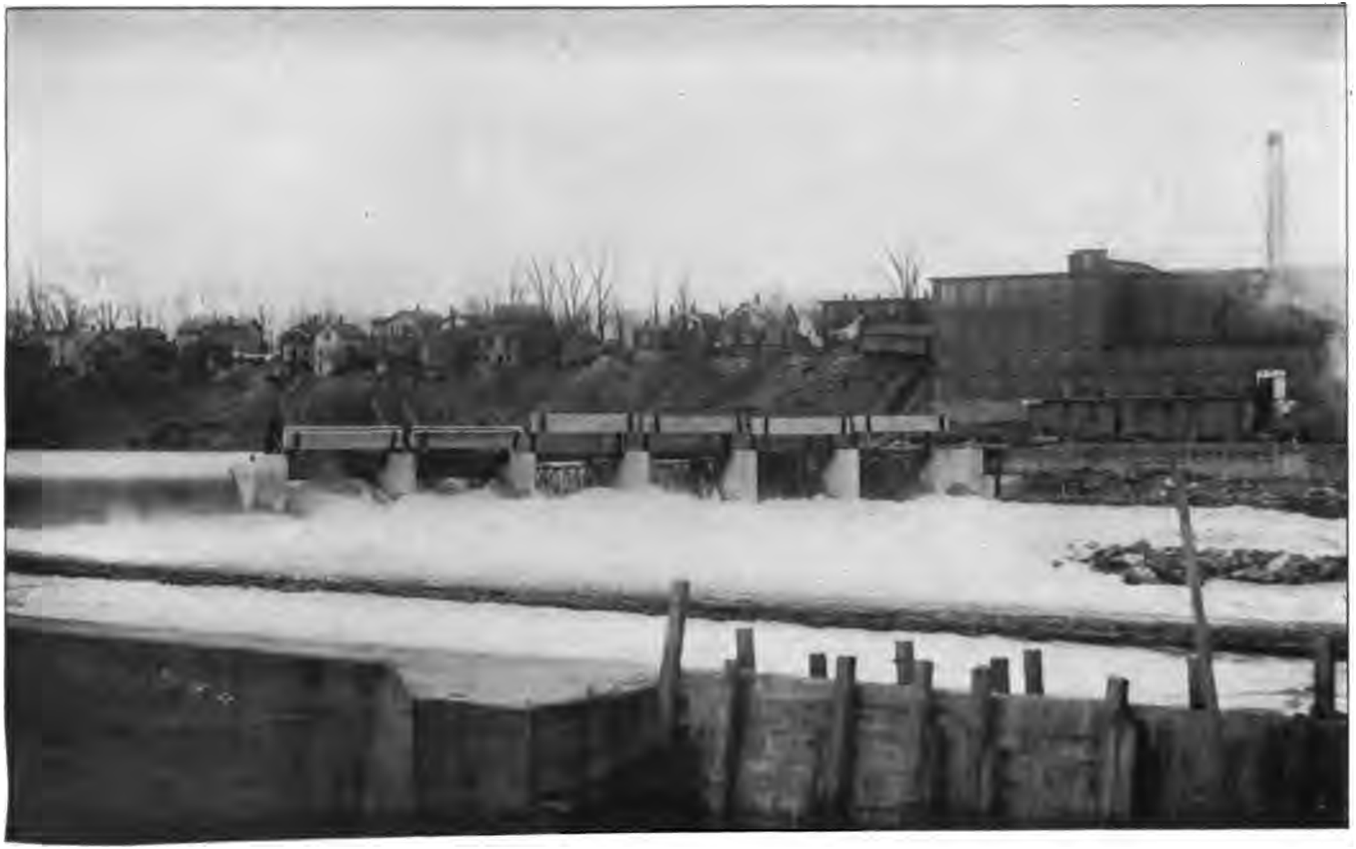
Table III embodies those contracts completed from January 1, 1911, to December 1, 1913.

Table IV embodies those contracts which were completed from January 1, 1911, to December 1, 1913, with the exception of certain minor work which could not be performed owing to the condition of the work on adjoining contracts, the amount of this deferred work on the basis of the contract prices being $102,492. It is estimated that such deferred work can be performed at such time as it is possible so to proceed for the same amount, namely, $102,492.

Table V embraces data relative to the work on completed Barge canal contracts Nos. 5 and 5-A. After the award of contract No. 5 by legislative enactment, chapter 710, Laws of 1907, the route of the canal westerly from Fox Ridge to Lyons was changed and the difficulties with the contractor growing out of such change resulted in the cancellation of this contract and the reletting of the balance of the work in this locality along the new route as determined. By reason of such change the cost of work in this particular section was materially increased above that contemplated in the original contract and above the amount estimated for this section in the 1903 estimate.

Table VI embraces data relative to completed Barge canal contracts Nos. 2 and 17, upon which the original contractors failed to comply with the conditions of their contract, as a result of which the Canal Board cancelled the contracts and provided for the completion of the work under the terms of a new contract. The amount of the retained percentage on the work performed by the original contractor and the obligation of the bonding companies is more than sufficient to cover the additional cost on these contracts above that which would have been expended had the work been completed pursuant to the original contracts, Nos. 2 and 17.

Tables II, III, IV, V and VI appear on pages 25, 26, 27, 28 and 28 respectively.



Barge Canal, Contract No. 10-A.
Taintor gate section of the upper dam at Fulton. View during the spring flood of 1913.

TABLE II.

Contracts completed to January 1, 1911.

Contract No.	Canal.	Section.	CONTRACTOR.	Date of contract.	Original date to be completed.	Revised date for completion.	1903 estimate.	Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.	Amount of final account.	Amount of extra work.	Total amount of work.
3	Champlain.......	2	Sundstrum & Stratton......	4- 4-'05	4-15-'07	12- 1-'08	$672,280	$760,576	$670,497	$657,273	$633,290	$54,839	$688,129
7	Erie, Champlain..	.....	Groton Bridge Company....	8-10-'06	7- 1-'06	7- 1-'07	99,941	102,123	97,635	101,930	98,929	3,244	102,173
26	Champlain	2	Lake Erie Dredging Co.....	4- 6-'08	12- 1-'09	6- 1-'10	37,500	60,225	59,795	40,057	35,443	0	35,443
32	Champlain.......	2-3	Penn Bridge Company......	4-19-'09	1- 1-'10	1- 1-'10	57,976	59,820	46,797	46,797	44,375	0	44,375
34	Erie.............	1	M. Fitzgerald............	8- 8-'06	1- 1-'07	5-31-'07	45,518	22,604	20,612	22,449	22,258	59	22,317
38	"	9	Henry Tosh & Son.........	1-11-'09	5- 1-'09	5- 1-'09	19,764	20,131	17,157	16,870	16,287	348	16,635
45	"	6	Scott Bros................	5- 6-'08	5-20-'11	5-20-'11	534,098	425,124	467,514	472,802	418,652	867	419,519
			Totals................	....	....	....	$1,467,077	$1,450,603	$1,380,007	$1,358,178	$1,269,234	$59,357	$1,328,591

TABLE III.

Contracts completed between January 1, 1911, and December 1, 1913.

Contract No.	Canal.	Section.	CONTRACTOR.	Date of contract.	Original date to be completed.	Revised date for completion.	1903 estimate.	Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.	Amount of final account.	Amount of extra work.	Total amount of work.
4	Erie	5	Empire Engineering Corp.	4-18-'05	11-15-'07	12-31-'09	$792,200	$812,560	$726,815	$726,780	$720,073	$12,584	$732,657
4-B	"	5	E. J. Doyle & Company	12- 1-'10	3- 1-'11	3- 1-'11	0	1,353	1,385	1,351	1,332	0	1,332
6	"	9	Frank A. Maselli	5- 3-'05	5- 1-'08	9-15-'11	1,418,164	1,381,662	1,005,982	1,026,550	1,033,864	766	1,034,630
9	"	10	Thomas Crimmins Contracting Company	3-18-'05	5- 1-'10	6- 1-'11	886,520	724,014	755,995	803,297	655,461	3,594	659,055
11	"	1	Fort Orange Construction Company	5-21-'06	10- 1-'09	12- 1-'10	1,834,308	1,671,385	1,359,475	1,333,199	1,218,233	3,089	1,221,322
14-R	"	1-2	Thomas F. Riley	11-28-'11	1- 1-'12	1- 1-'12	....	533	724	724	629	0	629
15	Champlain	3	Atlantic, Gulf & Pacific Co.	8- 9-'06	8- 1-'10	4-15-'12	1,753,446	1,380,760	1,509,060	1,481,692	1,378,956	9,215	1,388,171
16	Erie, Champlain	.....	United Construction Co.	12-20-'06	1- 1-'09	1- 1-'09	80,234	70,719	63,473	92,956	89,394	3,067	92,461
25	Champlain	3	Atlantic, Gulf & Pacific Co.	11-19-'06	3- 1-'11	10- 1-'12	1,814,136	1,849,831	1,754,236	1,707,192	1,542,271	4,922	1,547,193
31	Erie	4	Casey & Murray	9- 2-'08	8-12-'12	2- 1-'13	897,693	813,800	829,770	831,302	751,342	2,063	753,405
37-R	Oswego	1	Salladin & Henrick	11-29-'12	7- 1-'13	7- 1-'13	....	5,333	4,891	4,891	3,659	23	3,682
41	Erie	9	Butler Bros. Construction Co.	12- 5-'08	12-31-'10	12-31-'10	381,648	383,190	281,330	273,238	241,644	97	241,741
53	Oswego	1	Scott Bros	8-16-'09	12-31-'11	12-31-'11	229,345	200,500	166,735	167,585	164,576	1,113	165,689
54	Champlain	2	Hunkin, Conkey Construction Co.	12-13-'09	2-15-'12	10- 1-'12	473,500	232,908	250,590	251,370	223,159	734	223,893
55	Erie	5	Arthur McMullen	10-19-'08	10-15-'11	6- 1-'12	711,083	1,014,525	905,347	945,840	882,773	2,038	884,811
55-R	"	5	Joseph Kalk & Alfred S. Brown	11- 3-'11	1- 1-'12	6- 1-'12	0	8,190	7,410	7,561	7,526	101	7,627
61	"	9	Cleveland & Sons Co.	10-13-'08	5-15-'12	7-15-'13	1,225,851	1,000,219	1,047,994	1,180,853	1,014,710	102	1,014,812
69	Champlain	1	I. A. Hodge & Co.	12-11-'09	12-31-'11	3- 1-'13	256,366	270,675	240,061	238,302	231,504	0	231,504
75	Erie	9-10	United Construction Co.	3- 1-'10	1- 1-'11	4-15-'12	107,100	39,525	42,917	42,917	41,028	2,814	43,842
76	"	8	The T. A. Gillespie Co.	12-23-'10	12-23-'13	12-23-'13	971,617	1,504,776	1,494,057	1,491,880	1,367,470	14,574	1,382,044
78	Oswego	1	Cunningham-Woodward Co.	4-18-'10	8-20-'10	8- 1-'11	0	55,154	47,721	49,026	50,068	51	50,119
79	"	1	Lupfer & Remick	9-23-'10	8- 1-'11	8- 1-'11	16,410	39,735	37,480	37,480	33,980	681	34,661
80	"	1	Walter Bradley	1-16-'11	2- 1-'12	6- 1-'12	51,310	134,340	117,391	117,391	110,886	1,148	112,034
85	"	1	Lupfer & Remick	8- 5-'11	1- 1-'12	4- 1-'12	....	12,783	13,238	13,151	12,098	241	12,339
86	Erie	3	Lathrop, Shea & Henwood Co.	9-23-'11	12-31-'11	12-31-'11	30,890	41,871	43,440	43,440	38,468	0	38,468
88	Champlain	1	Lathrop, Shea & Henwood Co.	11- 4-'11	6- 1-'12	12-20-'12	54,570	23,553	25,658	35,784	30,844	0	30,844
112	Erie	9-10	John Young	4-24-'13	5-10-'13	5-10-'13	0	130,500	120,350	120,350	120,519	0	120,519
113	"	9-10	Wm. J. Dowdle	4-15-'13	5-15-'13	5-15-'13	0	26,452	21,964	21,964	21,920	0	21,920
			Totals	....	....	....	$13,986,391	$13,830,846	$12,875,489	$13,048,066	$11,988,387	$63,017	$12,051,404

TABLE IV.

Contracts completed between January 1, 1911, *and December* 1, 1913, *except certain work deferred to await the general completion of the entire enterprise.*

Contract No.	Canal.	Section.	CONTRACTOR.	Date of contract.	Original date to be completed.	Revised date for completion.	1903 estimate.	Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.	Amount of final account.	Amount of extra work.	Total amount of work.	Deferred work.
13	Erie	4-6	Penn Bridge Co.	11- 7-'08	4- 1-'10	4- 1-'10	$36,678	$29,775	$23,674	$24,331	$23,412	0	$23,412	$3,796
19	"	11	Great Lakes Construction Co.	11-26-'06	12-31-'10	12-31-'13	597,449	1,038,245	1,000,497	858,468	781,440	$37,425	818,865	32,933
33	Erie, Champlain, Oswego	....	Penn Bridge Co.	1- 7-'10	1- 1-'11	1- 1-'11	82,786	183,619	199,640	175,537	165,183	5,639	170,822	24,102
36	Erie	2-3	J. D. Miller	5-25-'10	12-31-'10	3-31-'12	0	72,000	44,800	46,800	46,800	410	47,210	200
40	"	10	United Engineering & Contracting Co.	11-27-'08	12- 1-'11	12-31-'13	812,388	2,516,743	2,166,298	2,237,256	2,086,100	823	2,086,923	14,826
60	"	9	Empire Engineering Corporation	8- 7-'08	1-31-'12	1-31-'13	1,395,526	1,267,301	1,349,084	1,484,803	1,308,740	28,342	1,337,082	6,513
66	"	10	Empire Engineering Corporation	9-22-'08	10-15-'11	10-15-'11	1,138,053	751,039	750,685	852,805	773,890	5,399	779,289	1,589
68	Champlain	1	Shanley-Morrissey, Inc.	11-23-'08	4-15-'12	4-15-'12	1,326,779	1,175,623	1,018,323	1,024,282	946,168	1,645	947,813	18,454
90	Erie, Champlain, Oswego	....	D'Olier Engineering Co.	4-12-'10	12- 1-'11	12- 1-'11	77,323	180,630	178,197	180,239	171,633	7,100	178,733	79
			Totals	....	....	....	$5,466,982	$7,214,975	$6,731,198	$6,884,521	$6,303,366	$86,783	$6,390,149	$102,492

TABLE V.

Contract canceled by the Canal Board, the completion of which is without liability to the bondsmen on the original contract.

(Relet; completed between January 1, 1911, and December 1, 1913 — Change of route between Fox Ridge and Lyons; Chap. 710, Laws of 1907.)

Contract No.	Canal.	Section.	CONTRACTOR.	Date of contract.	Original date to be completed.	Revised date of completion.	1903 estimate.	SUSPENDED CONTRACT.			RELET CONTRACT.			Amount of final account.	Extra work.	Total work to December 1, 1913.
								Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.	Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.			
5	Erie	7	Empire Engineering Corporation	4-18-'05	11-15-'07	11-15-'07	$179,886	$168,145	$151,172	$156,941				$125,820		$125,820
5-A	"	7	James Stewart & Company	1-20-'12	1-20-'13	1-20-'13					$395,285	$317,597	$326,902	319,351		319,351
			Totals				$179,886	$168,145	$151,172	$156,941	$395,285	$317,597	$326,902	$445,171		$445,171

TABLE VI.

Contracts canceled by the Canal Board, for the completion of which the bondsmen on the original contracts are liable on account of the failure of the contractors.

(Relet; completed between January 1, 1911, and December 1, 1913.)

Cont. No.	Canal.	Section.	CONTRACTOR.	Date of contract.	Original date to be completed.	Revised date of completion.	1903 estimate.	SUSPENDED CONTRACTS.			RELET CONTRACTS.			Amount of final account.	Extra work.	Total work to December 1, 1913.
								Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.	Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.			
2	Erie	1	The Ferguson Contracting Co.	4-3-'05	10-1-'07	11-1-'08	$1,037,244	$1,022,640	$852,330	$990,076				$694,390	$35,942	$730,332
2-E	"	1	Holler & Shepard	12-8-'09	3-1-'11	11-1-'12					$263,189	$261,668	$307,023	279,184	6,951	286,135
17	"	3	The Scofield Co.	12-29-'06	1-1-'10	1-1-'10	972,623	883,926	835,725	842,418				53,794		53,794
17	"	3	Alex'dr Murdoch	3-3-'08	10-1-'11	10-1-'11					836,221	804,516	812,286	751,352	2,917	754,269
			Totals				$2,009,867	$1,906,566	$1,688,055	$1,832,494	$1,099,410	$1,066,184	$1,119,309	$1,778,720	$45,810	$1,821,530

To recapitulate from Tables II, III, IV, V and VI, covering contracts completed to date, we find the following:

RECAPITULATION, TABLES II, III, IV, V AND VI.

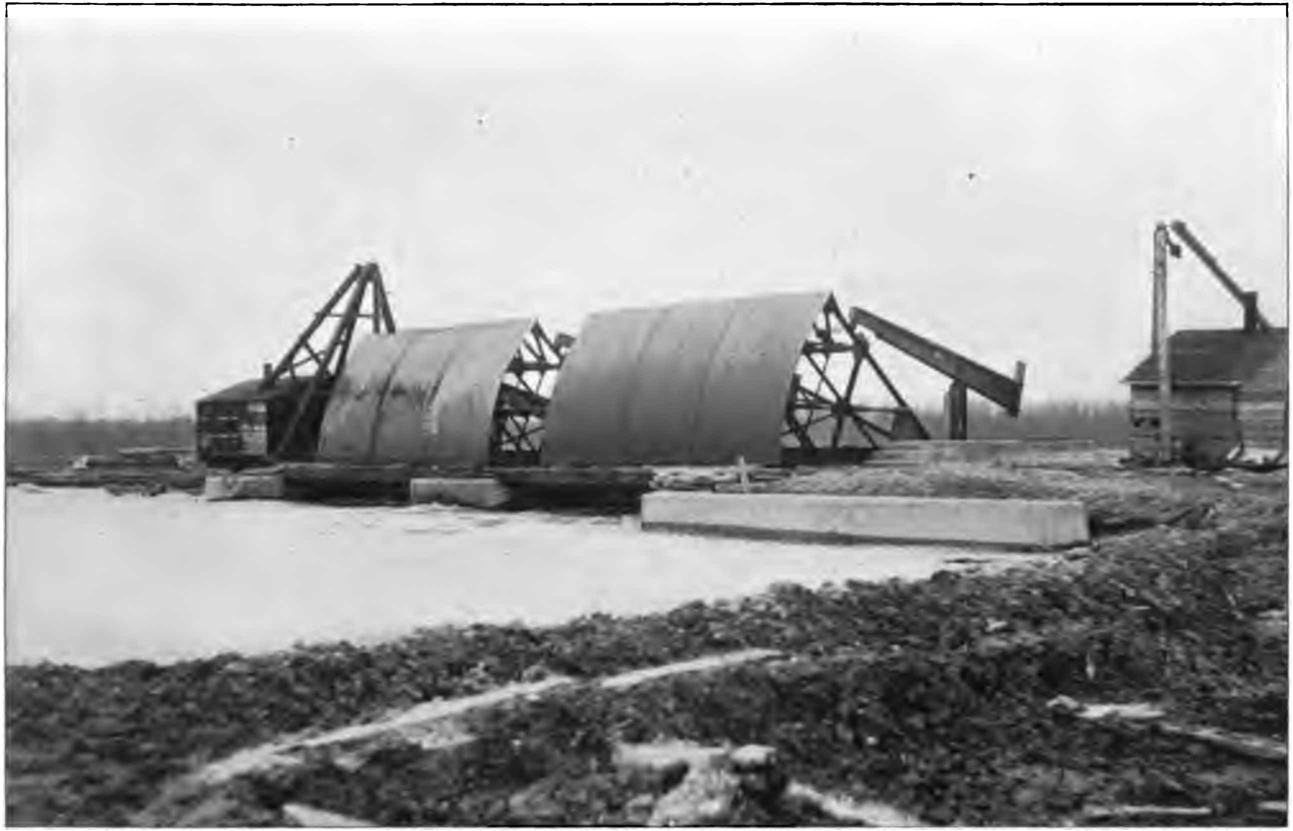
	1903 estimate.	Original amount of contracts.	Amount of contracts revised by alterations.	Total cost of construction
Contracts finished prior to January 1, 1911	$1,467,077	$1,380,007	$1,358,178	$1,328,591
Contracts completed, January 1, 1911, to December 1, 1913	16,176,144	15,169,216	15,404,223	14,321,105
Contracts completed, January 1, 1911, to December 1, 1913 (minor work deferred)	5,466,982	6,731,198	6,884,521	6,390,149
Cost to complete deferred work	....	....	....	102,492
Totals	$23,110,203	$23,280,421	$23,646,922	$22,142,337
Deduct increased cost, contracts Nos. 2 and 17, to be borne by securities	....	....	....	77,985
Net totals	$23,110,203	$23,280,421	$23,646,922	$22,064,352

It is therefore seen from these figures that the total cost for the completion of the above forty-eight contracts has been $1,045,851 less than the 1903 estimate for these particular sections; also $1,216,069, or approximately 5 per cent less than the amount of the original contracts, and 1,582,570, or approximately 6½ per cent less than the amount of the contracts as revised by alterations.

Table VII embodies data relative to Barge canal contracts Nos. 8 and 27, which were cancelled by the Canal Board and relet under the terms of new contracts Nos. 8-A and 27-A.

As the work under original contract No. 8 proceeded, it was found that the nature of the material encountered at the site of the proposed lock and dam at Scotia was not such as to afford the proper foundation for the structures to be erected, and it was further found impossible to carry on construction operations along the lines indicated in the original plans. After endeavoring to carry out the intent of the original plans for a period of about four years, and after giving careful consideration to all the conditions encountered, it was found necessary to cancel the original contract. Further study was given to the nature of the material in the vicinity of the proposed lock and dam site, as a result of which new contract No. 8-A was prepared along entirely different lines from the original contract, in that caisson foundations were provided throughout the entire length of the dam and lock. This type of construction was determined upon after the most careful examination of the conditions met and to be met upon the completion of the Barge canal. By reason of such changes the cost of the work at this point necessary to meet the unforeseen conditions will be in the neighborhood of $800,000, which is a proper charge against the so-called contingent item.

Under the terms of original contract No. 27 it was provided that lock No. 7 should be constructed in the vicinity of Fort Edward. As this work progressed it was found that a suitable foundation for the structure at the original site proposed could not be obtained. The site of the lock was therefore changed and the construction eliminated from original contract No. 27 was provided for under the terms of new contract No. 27-A along entirely different lines from those contemplated in the original contract. By reason of such change in the location of lock and the necessity for construction under the terms of the new contract and specifications, the cost of this work will be increased approximately $150,000 above that contemplated at the time of the execution of original contract No. 27. This increased cost is also a proper charge against the so-called contingent item.



Barge Canal, Contract A.

Two of the six Taintor gates forming the controlling works at the foot of Cayuga lake.

TABLE VII.

Contracts canceled by the Canal Board, the completion of which is without liability to the bondsmen on the original contracts.

(Relet; uncompleted to December 1, 1913 — Change of plans due to bad foundations.)

Cont. No.	Canal.	Section.	CONTRACTOR.	Date of contract.	Original date to be completed.	Revised date of completion.	1903 estimate.	SUSPENDED CONTRACTS.			RELET CONTRACTS.			Last monthly estimate.	Extra work.	Total work to December 1, 1913.
								Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.	Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations			
8	Erie	2	Pittsburg-Eastern Co.	5-22-'06	7-1-'09	1-1-'12	$1,255,169	$1,518,382	$1,433,817	$1,516,789				$920,420	$356	$920,776
8-A	"	2	The Foundation Co.	7-6-'12	7-15-'14	7-15-'14					$888,363	$799,399	$978,303	383,320	1,452	384,772
27	Champl'n	2	Kinser Construction Co.	11-23-'06	1-1-'10	1-1-'10	1,177,024	766,012	721,620	723,269				378,650	14,885	393,535
27-A	"	2	Holler & Shepard	12-1-'10	5-1-'12	5-1-'12					409,455	449,499	486,464	365,070	29,923	394,993
			Totals				$2,432,193	$2,284,394	$2,155,437	$2,240,058	$1,297,818	$1,248,898	$1,464,767	$2,047,460	$46,616	$2,094,076

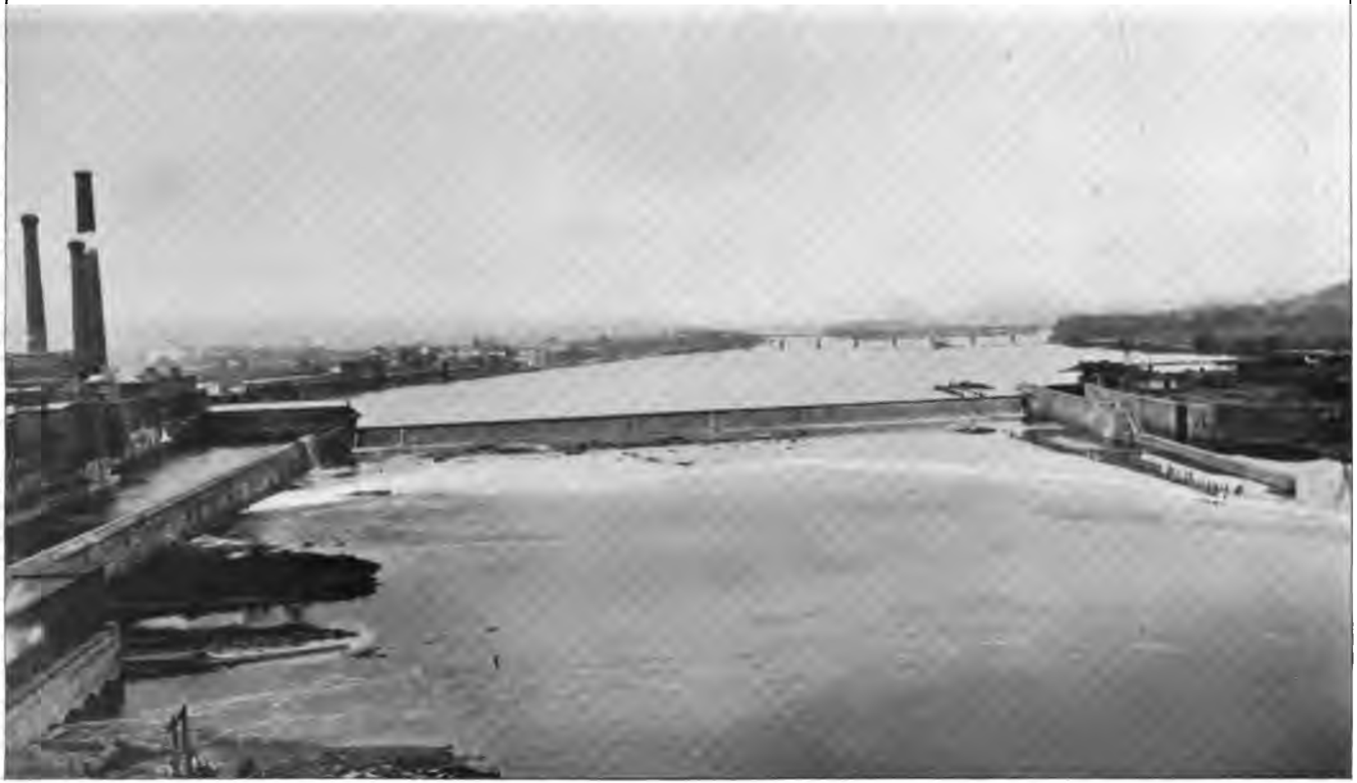
Table VIII shows contracts which were cancelled by the Canal Board due to the inability of the State to place the contractor in possession of the right of way at railroad crossings, or to the impossibility of conducting work under the original contract without interfering with navigation on the present canal system. As a result it will be necessary to provide for the reletting of the uncompleted work at such time as the State shall have made provision for placing the contractors in possession of the site of the entire right of way or when the work on adjacent Barge canal contracts has so progressed as to permit of the completion of such uncompleted work without interfering with navigation on the canals.

The amount of work performed under these contracts prior to their cancellation was $4,429,814, and it is estimated that the cost for the completion of the work to be performed at such time as this work may be progressed will be approximately $4,250,000.

Table IX embraces contracts which it has been necessary for the State to cancel due to the failure of the contractor to carry on the work in a satisfactory manner. These contracts have not as yet been completed and it is therefore not possible to give a definite figure showing the increased cost of completing the work by reason of such reletting. On these contracts the State has retained the 10 per cent of the moneys earned by the original contractors and has the bonding companies on the original contracts to hold responsible for the added increase in expense up to the amount of the bond furnished.

The amount of retained percentage plus the extent of the sureties held by the State on account of these contracts is approximately $840,000, making the apparent total amount of work to be performed on these contracts $7,260,044.

Tables VIII and IX appear on pages 33 and 34, respectively.



BARGE CANAL, CONTRACTS NOS. 68 AND 72-A.

View at Mechanicville, showing the Hudson river, which has been canalized by utilizing an existing dam and building a lock where a portion of the dam was cut away.

TABLE VIII.

Contracts canceled by the Canal Board, the completion of which is without liability to the bondsmen on the original contracts.

(To be relet after Dec. 1, 1913—Due to the inability of the State to place Contractor in possession of the right of way at R. R. crossings or to interference with navigation on the Old Canal or with construction on adjacent Barge Canal work.)

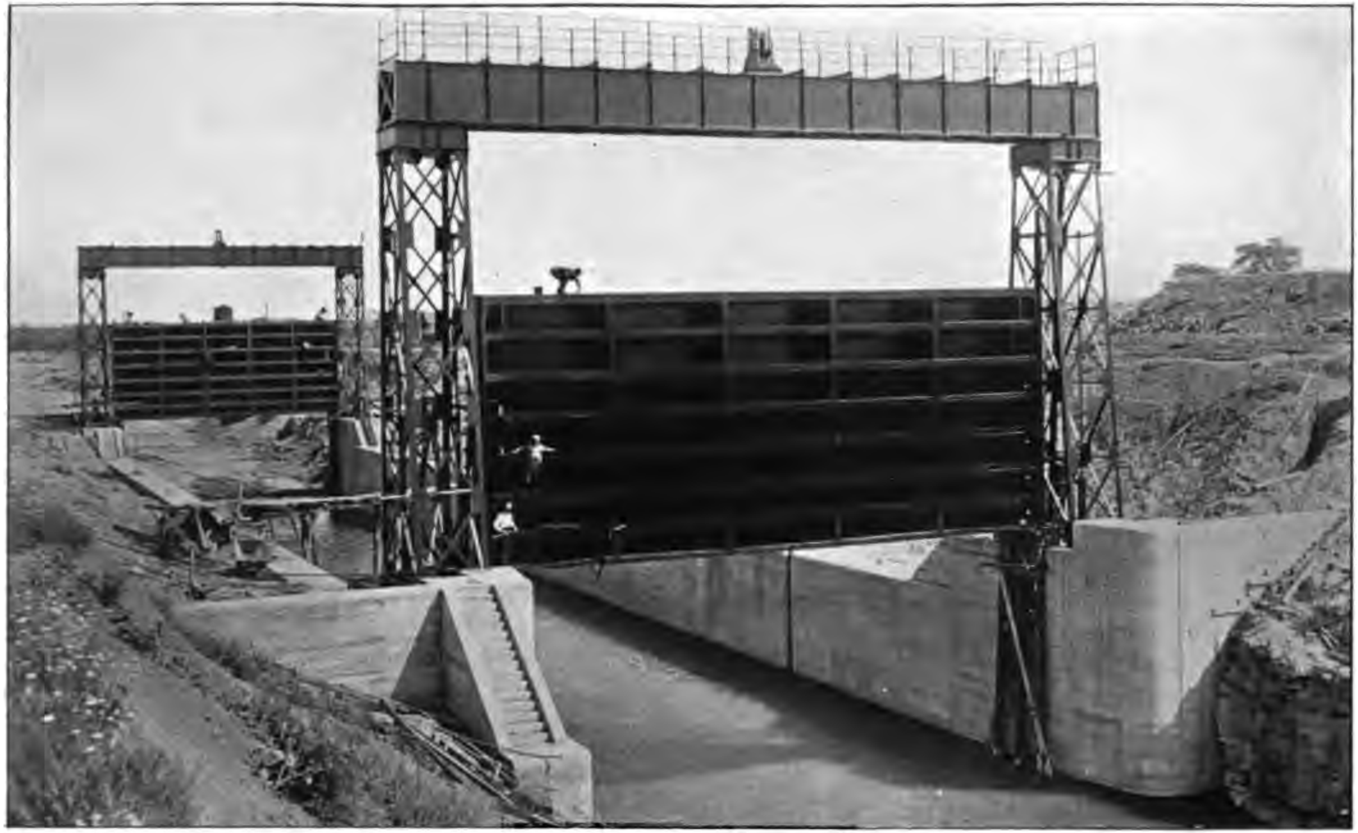
Contract No.	Canal.	Section.	CONTRACTOR.	Date of contract.	Original date to be completed.	Revised date of completion.	1903 estimate.	SUSPENDED CONTRACTS.			Last monthly estimate.	Extra work.	Total work to December 1, 1913.
								Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.			
1	Champlain....	2	Empire Engineering Corporation........	4-18-'05	10- 1-'09	10- 1-'10	$632,109	$619,846	$605,008	$580,424	$474,400	$7,834	$482,234
18	Erie	4	Kelley Bros. Contracting Co............	12-28-'06	12-20-'10	12-20-'10	1,105,899	785,980	859,460	611,382	476,979	19,606	496,585
20-A	"	4	Houston Barnard......................	8-20-'09	12-31-'13	12-31-'13	653,000	499,000	490,592	320,679	320,691	800	321,491
21	"	9	Lane Bros. Company..................	4- 7-'10	5- 1-'13	5- 1-'13	1,393,977	1,475,900	1,323,150	983,625	936,150	0	936,150
46	"	7	Kinser Construction Co...............	11-23-'08	6- 1-'12	12- 1-'13	1,470,906	1,367,583	1,212,833	842,721	842,689	0	842,689
47	"	8	Crowell Sherman-Stalter Co...........	11-30-'08	5-20-'12	5-20-'12	1,829,174	1,434,148	1,262,638	829,194	830,850	2,592	833,442
73	Champlain....	1	E. M. Graves.........................	5-26-'10	5-15-'13	5-15-'13	231,451	778,000	767,467	518,829	517,223	0	517,223
			Totals........................	....	....	....	$7,316,606	$6,961,417	$6,521,148	$4,686,854	$4,398,982	$30,832	$4,429,814

TABLE IX.

Contracts canceled by the Canal Board, for the completion of which the bondsmen on the original contracts are liable on account of the failure of the contractors.

(Relet: work under way.)

Contract No.	Canal.	Section.	CONTRACTOR.	Date of contract.	Original date to be completed.	Revised date of completion.	1903 estimate.	SUSPENDED CONTRACTS.			RELET CONTRACTS.			Last monthly estimate.	Extra work.	Total work to December 1, 1913.
								Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.	Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.			
10	Oswego...	1	McDermott Contracting Co....	6- 7-'06	12- 1-'10	9- 1-'11	$1,157,710	$1,149,988	$1,126,718	$1,187,169	....	....	....	$668,360	$2,019	$670,379
10-A	" ...	1	The T. A. Gillespie Co........	12-14-'11	9- 1-'12	9- 1-'12	....	....	....	....	$103,058	$106,738	$174,514	162,350	1,745	164,095
10-B	" ...	1	Oswego Construction Co., Inc...	3- 4-'12	12- 1-'13	12- 1-'13	....	....	....	....	515,044	491,295	500,213	502,910	4,865	507,775
42	Erie......	5	Shanley - Morrissey, Inc.......	7- 9-'09	2- 1-'12	2- 1-'12	1,609,937	1,312,814	1,163,625	1,047,366	....	....	....	478,670	0	478,670
42-A	"	5	Grant Smith & Co. & Locher..	2-24-'13	1- 1-'15	1- 1-'15	....	....	....	....	1,033,038	1,014,672	1,014,672	323,860	0	323,860
70	Champlain	1	Shanley - Morrissey, Inc.......	1-11-'10	12-31-'12	12-31-'12	282,500	749,300	779,636	779,636	....	....	....	236,240	0	236,240
70-A	"	1	Central Dredging Co...........	10-22-'12	12- 1-'15	12- 1-'15	....	....	....	....	790,488	759,159	759,159	104,040	0	104,040
71	"	1	Shanley - Morrissey, Inc.......	1-11-'10	1- 1-'13	1- 1-'13	911,000	1,502,100	1,561,119	1,614,886	....	....	....	821,960	4,345	826,305
71-A	"	1	P. McGovern & Co...........	1-16-'13	5-15-'15	5-15-'15	....	....	....	....	1,017,625	1,217,016	1,286,389	465,650	0	465,650
72	"	1	Shanley - Morrissey, Inc.......	12-14-'09	1- 1-'13	12-30-'12	1,496,599	1,439,733	1,192,758	1,221,112	....	....	....	618,900	0	618,900
72-A	"	1	James Stewart & Co., Inc.......	3-27-'13	5- 1-'16	5- 1-'16	....	....	....	....	1,396,585	1,534,603	1,534,603	572,890	0	572,890
			Totals.....	....	....	....	$5,457,746	$6,153,935	$5,823,856	$5,850,169	$4,855,838	$5,123,483	$5,269,550	$4,955,830	$12,974	$4,968,804



BARGE CANAL, CONTRACT NO. 21.
Erecting gates at the guard-lock just west of the Genesee river crossing.

It is my desire at this time to advise the Legislature relative to the various points covered in the resolution previously referred to.

(1) There has been expended during my term of office for actual construction work the sum of $38,065,772, of which amount the sum of $723,625 has been paid for extra or unspecified work orders. These figures do not include payments made, amounting to $438,329, covering the cost of reconstructing highways damaged by reason of canal construction, or the sum of $163,-050.50, paid by the Superintendent of Public Works pursuant to authorization of the Canal Board for constructing a temporary lock at Vischer's Ferry in order to maintain navigation and the making of alterations in the sloop lock and approaches at Troy, the cost of these latter projects being $22,456.19.

(2) From the monies accruing from bond issues, there had been expended for engineering prior to my administration the sum of $4,221,557.91, and there has been expended during my administration for engineering the sum of $3,339,226.59. The details of the expenditures for engineering are as follows:

ITEMS.	Total to January 1, 1911.	Total from January 1, 1911, to November 30, 1913.	Total.
Services	$3,627,560 35	$2,914,169 11	$6,541,729 46
Travel	194,817 18	142,850 33	337,667 51
Instruments, tools and appliances	35,263 13	3,296 64	38,559 77
Office rent	47,708 84	42,802 64	90,511 48
Fuel and light	11,841 11	6,624 96	18,466 07
Stationery and printing	42,887 52	24,221 40	67,108 92
Postage	8,456 55	7,048 06	15,504 61
Telephone and telegraph	22,174 95	19,809 10	41,984 05
Miscellaneous	230,848 28	178,404 35	409,252 63
Totals	$4,221,557 91	$3,339,226 59	$7,560,784 50

By comparing the amounts expended for engineering with the amount of work done during corresponding periods the following is found:

Up to January 1, 1911, the engineering amounted to 16½ per cent of the construction work performed. For a part of this time prior to January 1, 1911, plans were being prepared and no construction work was under way.

From January 1, 1911, to December 1, 1913, the cost of engineering has been 10.2 per cent of the construction work performed during the corresponding period.

The total cost of engineering since the beginning of the Barge canal improvement is approximately 11½ per cent of the total amount of work performed.

In addition to the preparation of plans and the supervision during construction, the payments made for engineering have covered the making of surveys of over 30,000 acres of land, the preparation of maps for the same and the cost of engineers testifying before the courts on matters of litigation growing out of the Barge canal work.

In so far as the engineering force in this department is concerned, all the rules and regulations of the State Civil Service Commission have been complied with and all payrolls for services rendered have first been approved by the State Civil Service Commission before payment and before audit by the Comptroller.

No monies are disbursed by the State Engineer other than for engineering expenses. For the information of the Legislature there is given the following data showing payments made during each fiscal year on account of the various expenses incidental to this improvement, such information as does not pertain directly to the cost of construction or engineering having been obtained from the office of the State Comptroller.

CLASSIFICATION OF EXPENDITURES ON ACCOUNT OF THE CONSTRUCTION OF THE ERIE, CHAMPLAIN AND OSWEGO BARGE CANALS FOR EACH FISCAL YEAR TO AND INCLUDING SEPTEMBER 30, 1913.

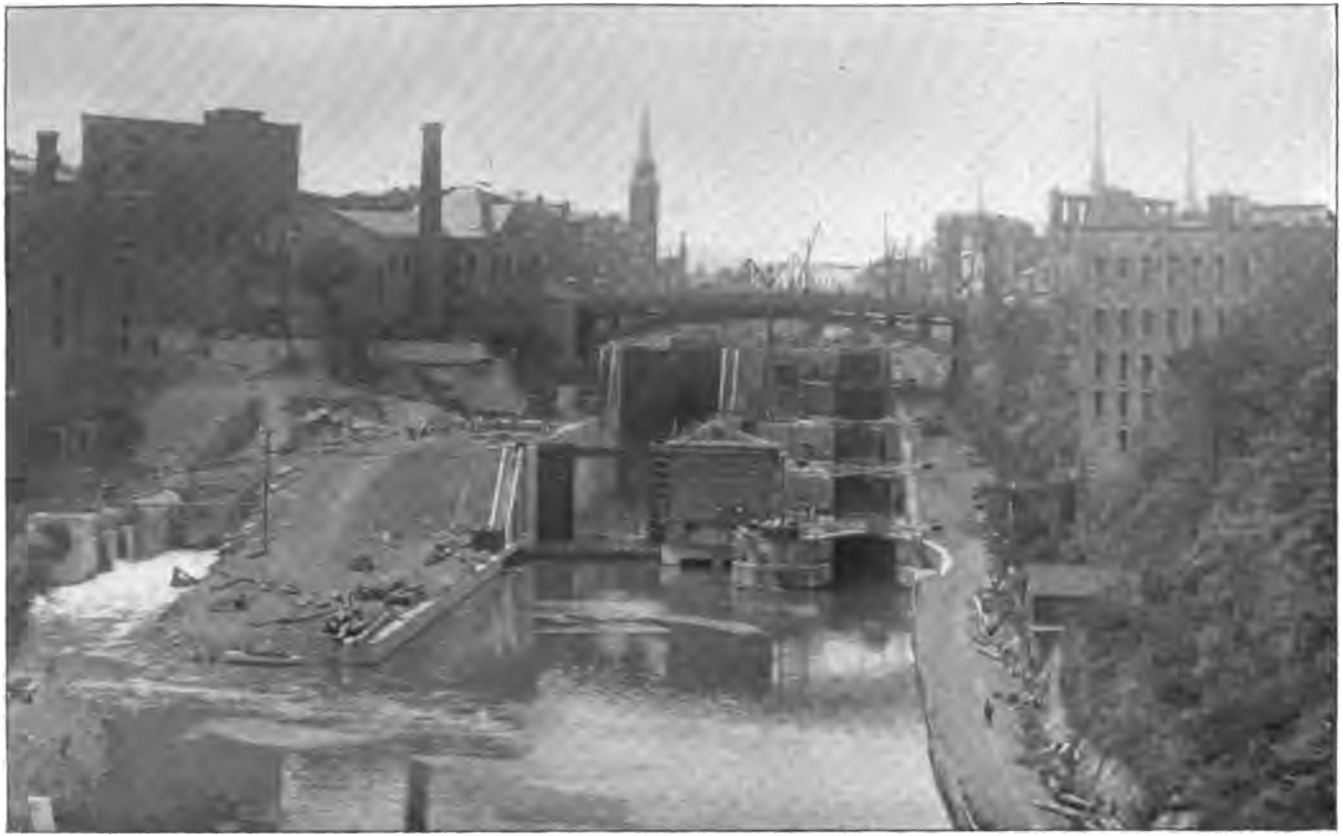
FOR THE PURPOSE OF	1901.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	Total.
Engineering expenses	$168,577 98	$315,177 53	$443,863 52	$506,122 94	$742,790 19	$906,629 76	$901,475 82	$1,032,647 33	$1,167,152 41	$1,182,569 49	$7,370,006 97
Salaries and expenses of Advisory Board of Consulting Engineers	21,061 38	37,593 58	36,855 00	34,156 10	41,403 13	41,209 76	41,664 86	34,288 48	....	{ *11,028 14 {	11,028 14 288,322 29
Salary and expenses of Advisory Engineer to Superintendent of Public Works	....	....	....	1,111 11	9,999 96	10,833 37	916 66	1,370 62	3,178 95	3,093 50	30,501 17
Payments to contractors on estimates	....	46,890 00	496,951 58	1,369,041 29	3,214,882 61	6,801,841 18	7,540,005 67	12,123,603 01	12,787,363 22	12,143,657 82	56,536,239 38
Payments to contractors for damages	....	....	....	....	....	103,893 30	4,463 92	....	86,125 68	443,733 63	613,216 53
Constructing highways in lieu of existing highways	....	....	....	....	....	1,581 33	9,590 54	81,723 41	123,895 31	147,536 92	364,336 51
Protecting existing canal structures	....	....	....	1,146 42	14,837 00	14,901 31	8,740 27	40,732 42	44,100 37	233,750 32	358,298 23
Advertising for bids on contracts	....	735 50	951 35	1,459 70	2,977 55	3,984 30	4,018 35	3,211 71	2,430 40	5,081 92	24,850 78
Expenses in the printing and execution of contracts, serving notices of appropriations of lands, etc.	....	998 91	1,229 78	1,901 52	1,720 50	2,263 58	3,372 23	5,071 54	8,196 57	11,276 38	36,040 01
Recording maps of lands appropriated	....	149 86	37 67	332 94	103 43	306 45	1,383 20	1,037 20	832 26	409 91	4,772 92
Recording deeds of lands appropriated	....	....	9 90	43 68	74 82	73 34	136 26	64 91	44 40	155 05	602 36
Payments for lands appropriated and for damages to lands, etc.	....	1,622 24	174,594 88	188,002 24	179,499 20	343,365 88	777,289 25	2,327,547 61	1,099,183 89	1,498,427 61	6,589,533 80
Salaries and expenses of Board of Special Examiners and Appraisers of lands	10,491 69	26,491 19	25,849 12	23,831 23	13,955 64	....	....	....	....	....	100,618 92
Salaries and expenses of Special Examiner and Appraiser of lands	....	....	....	....	2,697 49	6,549 39	7,263 14	13,228 54	15,196 43	15,909 87	60,844 86
Investigating claims, witness fees, etc.	....	....	495 60	1,055 15	3,566 85	20,116 77	40,938 91	33,966 57	26,940 17	31,839 04	158,469 06
Preparing barge canal bonds	....	4,140 54	....	4,886 58	4,426 89	6,132 99	6,489 43	7,780 00	15,228 34	11,783 77	60,868 54
Advertising sale of barge canal bonds	....	3,033 50	3,080 50	2,585 50	328 50	17,607 38	2,018 29	8,301 80	17,550 59	....	54,506 06
Publishing barge canal proposition	129,126 25	....	....	....	....	....	....	....	....	....	129,126 25
Clerical services to Comptroller	....	....	120 97	1,059 82	1,200 00	2,837 91	3,856 75	3,800 00	7,103 51	20,337 31	40,766 27
Total	$329,257 30	$436,832 85	$1,174,042 87	$2,136,736 27	$4,234,562 85	$8,292,398 03	$9,365,632 55	$15,718,375 15	$15,401,522 50	$15,760,590 68	$72,862,951 05

* Salary and expenses of Consulting Engineers to Canal Board.

(3) There has been incorporated above in this report brief statements and tables with reference to all contracts that have been canceled for one cause or another and also data referring to such contracts as have been relet. Whenever contractors have failed to complete their contracts, due to the fault of the contractor, the State has retained the 10 per cent from the monies earned on their contract and has not released the bonding companies from their obligation guaranteeing a faithful performance of all the work. The bonding companies will properly be called upon to reimburse the State in an amount equal to the difference in increased expenses on account of such reletting and the amount of monies retained and now in the hands of the State.

(4) The so-called contingent item, to which reference has from time to time been made, as having been embodied in the report submitted to the Legislature by former State Engineer and Surveyor Bond, and amounting to $4,365,454, is not a fund existing by itself and never was a separate item, but was an amount added to the total of the estimate originally prepared in order to cover expenses which might be incurred in meeting unforeseen conditions as the work progressed, as is evident from the information furnished the Legislature by former State Engineer Bond in answer to the questions propounded in 1903, from which I beg to quote the following:

> " 7. 'How much allowance is made for unseen contingencies and expenses?'
>
> " The Barge Canal report estimates allow ten per cent for engineering and contingencies.
>
> " 7a. 'And for estimates that may prove erroneous?'
>
> " There was no allowance made other than the ten per cent above mentioned, but in view of the fact that Assembly Bill No. 330 makes provision for the salaries and expenses of five expert civil engineers, no provision for whom was made in the estimates for the Barge Canal; and also considering that it could scarcely be expected that a work of this magnitude could be completed within less than seven years, I have deemed it wise to add to my former estimate five per cent to cover the added expense which will be incurred by this bill and for a reasonable allowance ' for estimates that may prove



Barge Canal, Contract No. 67.
General view of the flights of two new and five old locks at Lockport.

> erroneous' by reason of unforeseen difficulties and defective foundations or conditions which the utmost engineering skill might not be able to determine in advance."

These figures as added are purely an estimated item, no definite items upon which to base the same having been considered.

As the Barge canal work has progressed it has been necessary, as was contemplated at the time of the preparation of the original estimates, to make certain additions and changes in contracts originally placed in effect, in order to meet unforeseen conditions, which the preliminary study and investigation had not disclosed. These changes have been necessary in order to remedy defects in the original plans and in order to provide proper strength and proper types of structures. By reason of such additions and changes the expense of the work has naturally been increased.

Briefly I beg to call attention to certain of the larger increases in cost in the making of these changes: The construction of embankments and concrete trough in the western part of the state, particularly at Irondequoit creek and Bushnell's Basin and in the vicinity of Holley and Brockport, at an additional cost approximating $1,000,000; additional work necessary in order to provide proper foundation and protection for dams in the Mohawk river, particularly at Rotterdam and Scotia, $1,000,000; the great discrepancy between the 1903 estimate and the amount of the work contracted for covering section 1 of the Champlain canal, this apparent erroneous estimate being approximately $3,000,000; and in addition to these larger increases in order to meet unforseen conditions there have been many necessary smaller changes made.

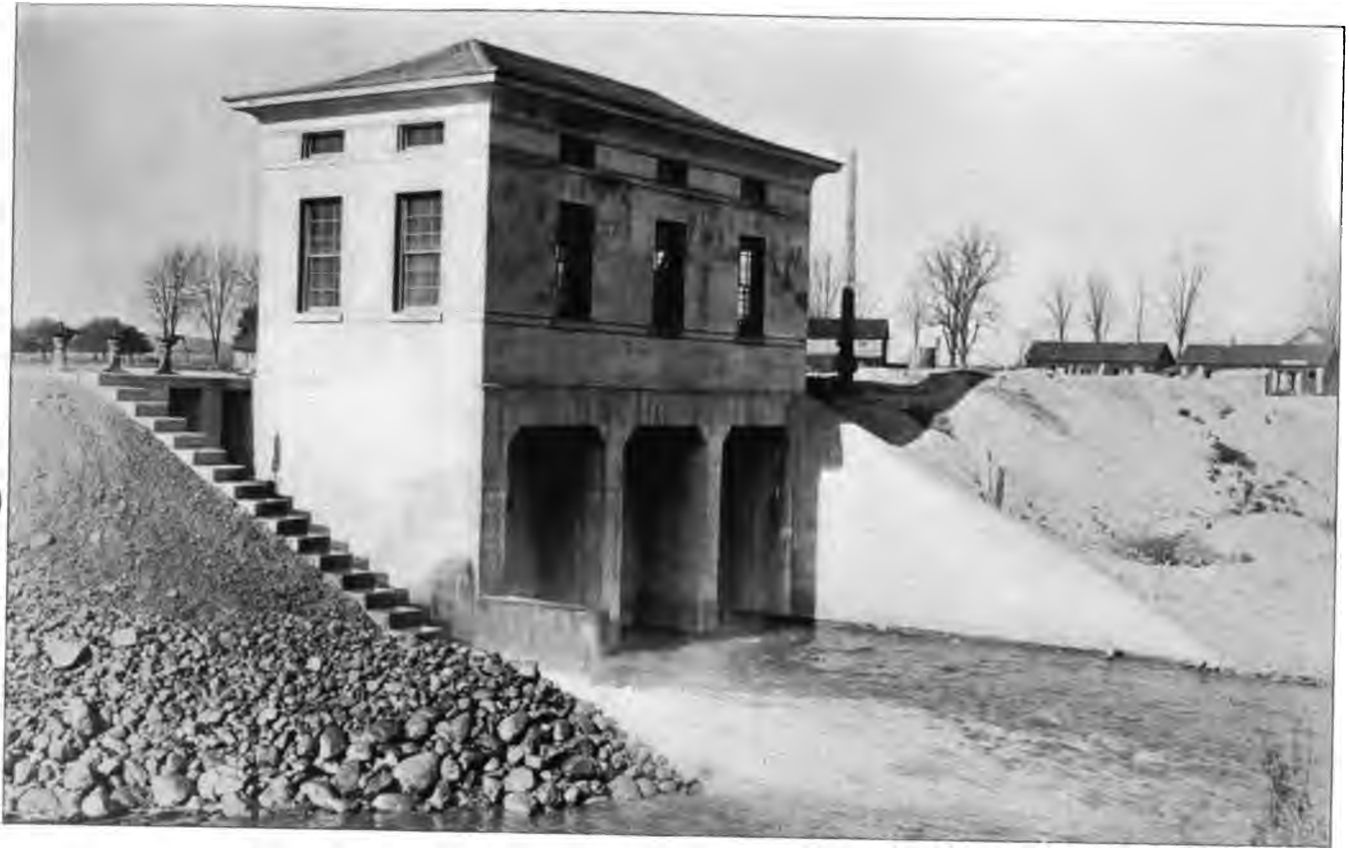
In addition to the changes enumerated above attention is also called to the erroneous estimate for the equipment necessary to operate the locks, in that the 1903 estimate contained an item of approximately $265,000, while it is found that in order to provide proper operating machinery the increased cost of the same will be in the neighborhood of $2,000,000, making a total increase, in order to meet unforeseen conditions and correct erroneous estimates, amounting to over $7,000,000.

In addition to these changes additional burdens have been placed upon the Barge canal appropriation by action of the Canal Board or by legislative enactment aggregating in the neighborhood of $5,600,000, these burdens consisting of the following: Change in width of locks from 28 feet to 45 feet, by action of the Canal Board on July 27, 1905; change in the Barge canal line from Fox Ridge westerly to Lyons and change in a section of prism between Lockport and Tonawanda by chapter 710 of the Laws of 1910; change in the type of bridges to be constructed over the Oswego canal by chapter 83 of the Laws of 1910.

It is therefore seen from the above that the total of added burdens and the cost to meet the principal unforeseen conditions and remedy erroneous estimates exceeds the sum of $12,600,000.

It must also be borne in mind that, due to the enforcement of the eight-hour labor law, the increase in the cost of contracts has consequently been material and that the additional cost for completing the work on contracts interfered with by railroad crossings will still further increase the amount to be expended in order to meet unforeseen conditions.

In the report of former State Engineer Frank M. Williams, covering the work to the 31st day of December, 1910, it was stated that the whole canal could be completed within the original appropriation, since 96 per cent of the entire length of canal was under contract at prices aggregating two or three millions of dollars less than the 1903 estimate for these particular pieces of work. This statement is undisputed in so far as length of the work under contract is concerned and in so far as it was a fact that the face value of the contracts in effect at that time was approximately $3,000,000 less than the preliminary 1903 estimate covering the same territory. However, it must be borne in mind that all the conditions affecting the work on these particular contracts then awarded had not been given due consideration and, as previously stated in this report, many of the contracts were let without provision having been made for passing the lines of railroads encountered or for taking care of navigation which would of necessity have been destroyed, if the original contracts as let had been carried on to completion along their original lines. No feasible plan had been devised to meet this situation when encountered, which must have been apparent at



Barge Canal, Contract No. 94.
Power-house at lock No. 29, near Palmyra.

UNIV. OF MICH.

the time of the preparation of the plans. Furthermore, no provision was embodied in these contracts for their continuation after expiration in the event of the contractor having performed such work as was possible and being prevented from continuing further by reason of the existence of these two obstructions, namely, the railroads and the necessity for maintaining navigation on the old canal. Conditions have also been encountered in progressing the work on many of the contracts which were not known at the time of the preparation of the plans and could only be ascertained as the work developed. In order to meet these unforeseen difficulties, it has been necessary materially to modify the original plans, increasing the cost above that originally estimated, to meet which condition the so-called contingent item was intended.

I believe it is proper to state that no work as extensive as the Barge canal improvement and with the variety of conditions to be met has been performed with as little variation in the actual expense of the work contemplated as will be the case of this improvement when completed.

(5) Table X embodies a statement of all Barge canal contracts let since the first of January, 1911, including the contracts let under the so-called $101,000,000 on the Erie, Champlain and Oswego canals and the contracts let under the statute authorizing the improvement of the Cayuga and Seneca canal to Barge canal dimensions. These contracts have been awarded by the Superintendent of Public Works on the basis of plans and specifications prepared by the State Engineer and approved by the Canal Board in accordance with the procedure as laid down in the statutes authorizing these improvements. All of the information relative to the detailed bids for contracts awarded prior to October 1, 1912, has heretofore been presented to the Legislature in the reports of the Superintendent of Public Works.

TABLE X.

All contracts let after January 1, 1911.

Cont. No.	Canal.	Section.	CONTRACTOR.	Date of contract.	Original date to be completed.	Revised date to be completed.	1903 estimate.	Engineer's estimate.	Original amount of contract.	Amount of contract revised by alterations.	Last monthly estimate.	Extra work.	Total work to December 1, 1913.
			FINISHED CONTRACTS.										
			Relet Contracts.										
5-A	Erie	7	James Stewart & Co	1-20-'12	1-20-'13	1-20-'13	0	$395,285	$317,597	$326,902	$319,351	0	$319,351
			New Contracts.										
14-R	Erie	1-2	Thomas F. Riley	11-28-'11	1- 1-'12	1- 1-'12	0	533	724	724	629	0	629
37-R	Oswego	1	Salladin & Henrick	11-29-'12	7- 1-'13	7- 1-'13	0	5,333	4,891	4,891	3,659	$23	3,682
55-R	Erie	5	Joseph Kalk & Alfred S. Brown	11- 3-'11	1- 1-'12	6- 1-'12	0	8,190	7,410	7,561	7,526	101	7,627
80	Oswego	1	Walter Bradley	1-16-'11	2- 1-'12	6- 1-'12	$51,310	134,340	117,391	117,391	110,886	1,148	112,034
85	"	1	Lupfer & Remick	8- 5-'11	1- 1-'12	4- 1-'12	0	12,783	13,238	13,151	12,098	241	12,339
86	Erie	3	Lathrop, Shea & Henwood Co	9-23-'11	12-31-'11	12-31-'11	30,890	41,871	43,440	43,440	38,468	0	38,468
88	Champlain	1	Lathrop, Shea & Henwood Co	11- 4-'11	6- 1-'12	12-20-'12	54,570	23,553	25,658	35,784	30,844	0	30,844
112	Erie	9-10	John Young	4-24-'13	5-10-'13	5-10-'13	0	130,500	120,350	120,350	120,519	0	120,519
113	"	9-10	Wm. J. Dowdle	4-15-'13	5-15-'13	5-15-'13	0	26,452	21,964	21,964	21,920	0	21,920
			Totals				$136,770	$778,840	$672,663	$692,158	$665,900	$1,513	$667,413
			CONTRACTS UNDER WAY.										
			*Relet Contracts.**										
8-A	Erie	2	The Foundation Co	7- 6-'12	7-15-'14	7-15-'14	$1,225 169	$888,363	$799,399	$978,303	$383,320	$1,452	$384,772
10-A	Oswego	1	The T. A. Gillespie Co	12-14-'11	9- 1-'12	9- 1-'12	1 157 710	103,058	106,738	174,514	162,350	1,745	164,095
10-B	"	1	Oswego Construction Co., Inc	3- 4-'12	12- 1-'13	12- 1-'13		515,011	491,295	500,213	502,910	4,865	507,775
42-A	Erie	5	Grant Smith & Co. & Locher	2-24-'13	1- 1-'15	1- 1-'15	1 609,937	1,033,038	1,014,672	1,014,672	323,860	0	323,860
70-A	Champlain	1	Central Dredging Co	10-22-'12	12- 1-'15	12- 1-'15	282 500	796,488	759,159	759,159	104,040	0	104,040
71-A	"	1	P. McGovern & Co	1-16-'13	5-15-'15	5-15-'15	911 000	1,017,625	1,217,016	1,286,389	465,650	0	465,650
72-A	"	1	James Stewart & Co., Inc	3-27-'13	5- 1-'16	5- 1-'16	1,496 500	1,396,585	1,534,603	1,534,603	572,890	0	572,890
			Totals for relet contracts				$6,712 915	$5,744,201	$5,922,882	$6,247,853	$2,515,020	$8,062	$2,523,082
			New Contracts.										
14-A	Erie	1	John Henkes	10-26-'12	5-15-'13	1- 1-'14	0	$4,765	$4,318	$4,046	$3,560	0	$3,560
22-A	"	7	Lupfer & Remick	8- 8-'12	12- 1-'12	11- 1-'13	0	24,916	27,099	27,099	21,900	0	21,900
24	Champlain	2	Kingsbury Construction Co	11- 1-'11	4-30-'12	1- 1-'14	$30,300	46,692	44,368	44,368	38,810	0	38,810

56	Champlain	2	Flood & Van Wirt Co	9-26-'12	9-26-'14	9-26-'14	331,350	317,638	319,956	361,746	259,370	$744	260,114
57	Erie	6	N. Y. State Dredging Corporation	8- 6-'12	8-15-'13	7-31-'14	111,071	85,625	93,596	93,596	74,160	0	74,160
65	"	10	Maryland Dredging & Contracting Co	3-26-'13	12-31-'14	12-31-'14	650,482	1,131,523	1,000,098	1,000,098	370,310	0	370,310
87	"	4	P. B. McCaghey & Co	2-17-'13	8- 1-'13	11- 1-'13	0	10,900	11,202	11,202	11,060	0	11,060
89	"	8	Owego Bridge Co	5-28-'12	4- 1-'13	4- 1-'13	38,928	65,116	59,616	59,616	28,930	0	28,930
90-A	Oswego	1	Lupfer & Remick	8- 8-'12	5- 1-'13	10- 1-'13	6,830	64,840	64,020	64,020	40,930	0	40,930
91	Erie	1	The Hollington Co	1- 5-'11	9- 1-'11	9- 1-'13	24,807	44,600	42,940	44,985	42,900	0	42,900
92	Erie	....	MacArthur Bros. & Lord Electric Co	3-17-'13	5- 1-'15	5- 1-'15	326,701	1,244,940	1,178,976	1,178,976	49,880	0	49,880
93	Erie, Oswego	....	MacArthur Bros. & Lord Electric Co	8-12-'13	5- 1-'15	5- 1-'15	110,505	393,701	379,693	379,693	2,700	0	2,700
94	Erie	8-11	MacArthur Bros. & Lord Electric Co	2-17-'13	11- 1-'14	11- 1-'14	124,777	461,300	433,381	433,381	25,180	0	25,180
100	Erie, Oswego	....	W. J. Burns Co	9-17-'13	10 1-'14	10- 1-'14	58,924	181,923	179,061	179,061	0	0	0
101	Erie	6	Barrally & Ingersoll	8- 8-'12	9- 1-'13	9- 1-'13	24,468	44,599	40,639	40,984	24,220	941	25,161
102	"	7	Lupfer & Remick	2-20-'13	7- 1-'13	10- 1-'13	19,911	25,035	25,993	25,993	11,810	0	11,810
103	Oswego	1	Barrally & Ingersoll	12-10-'12	12- 1-'13	12- 1-'13	18,618	185,655	197,995	197,995	42,770	0	42,770
104	"	1	R. B. Murdock	3- 5-'12	12-31-'12	7- 1-'13	14,059	45,580	39,370	39,370	36,610	0	36,610
105	Erie	9-10	Skene & Richmond	4-19-'12	5- 1-'13	8-31-'13	158,800	253,010	258,710	259,355	246,640	0	246,640
107	"	4	Jackson L. Richmond	2-19-'13	5- 1-'14	5- 1-'14	27,328	124,471	127,707	127,707	6,950	0	6,950
108	"	8	I. M. Ludington's Sons, Inc	10-17-'13	5- 1-'14	5- 1-'14	30,879	99,341	94,394	94,394	4,370	0	4,370
114	"	1	F. W. Leonhard	10- 7-'13	5- 1-'14	5- 1-'14	0	36,327	35,504	35,504	0	0	0
			Totals for new contracts				$2,108,738	$4,892,497	$4,658,636	$4,703,189	$1,343,060	$1,685	$1,344,745
			Relet contracts				6,712,915	5,744,201	5,922,882	6,247,853	2,515,020	8,062	2,523,082
			Totals for contracts under way				$8,821,653	$10,636,698	$10,581,518	$10,951,042	$3,858,080	$9,747	$3,867,827

CAYUGA AND SENECA CONTRACTS (UNDER WAY)

							1909 est.						
C	Cayuga and Seneca	1	Larkin & Sangster	1-11-'13	1-15-'16	1-15-'16	$767,382	$1,140,872	$1,187,047	$1,189,246	$365,970	0	$365,970
E	" "	1	Cleveland & Sons Co	1- 7-13	1- 7-'15	1- 7-'15	572,550	319,666	347,216	352,906	42,120	0	42,120
H	" "	1	N. Y. State Dredging Corporation	12-22-'11	1- 1-'13	1- 1-'13	0	178,237	179,769	225,001	217,360	0	217,360
I	" "	1	Central Dredging Co	9-23-'12	3- 1-'14	3- 1-'14	0	304,330	215,639	215,639	165,900	$300	166,200
			Totals				$1,339,932	$1,943,105	$1,929,671	$1,982,792	$791,350	$300	$791,650

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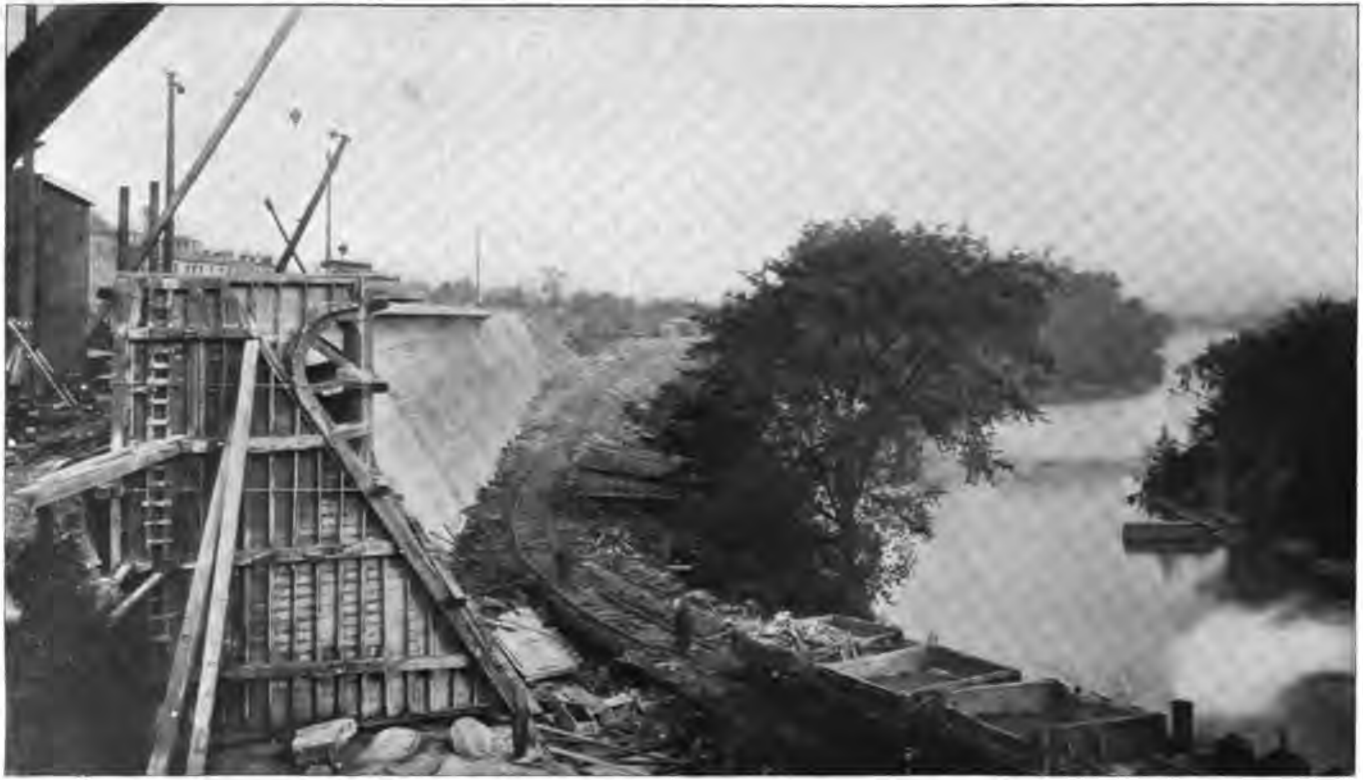
* Work to the amount of $3,751,270 was performed under the terms of the original contracts prior to cancellation. The retained percentages and surety bonds on contracts Nos. 10, 42, 70, 71 and 72 to be applied to the increased cost, due to reletting, is approximately $810,000.

The unit prices received for the various items of work to be performed and embraced in contracts let since January 1, 1911, compare most favorably with prices received for similar classes of work embraced in contracts awarded prior to 1911, particularly so in view of the increased cost of labor and materials in recent years.

The tables given above embody complete information relative to each and every contract, showing the amounts of such contracts as affected by alterations and the amount of work performed on each contract under the terms of the so-called extra and unspecified work orders, also the total amount of work performed on all contracts.

(7) The Barge Canal Law provides the method under which all work authorized thereunder shall be awarded. The method prescribed is that the State Engineer and Surveyor shall prepare the necessary plans and specifications, that these shall be approved by the Canal Board, and after such approval, the Superintendent of Public Works advertises for proposals. In certain instances, where the amount of work to be performed has been estimated at less than $10,000, bids have been invited by the Superintendent of Public Works without public advertisement, but on all contracts providing for the construction of the canal, the estimate for which exceeded $10,000, proposals were invited by public advertisement, pursuant to the direction of the Canal Law. I know of no case wherein any contract embracing work to be performed on the Barge canal has been awarded to parties other than the one submitting the lowest bid covering the work embraced therein.

(8) As stated elsewhere in this report the total amount of the contracts in effect on December 1, 1913, was $77,800,569, and on these contracts there had been completed work to the amount of $64,153,809, this figure not including payments made by the Superintendent of Public Works for work at the sloop lock, Troy, and in constructing a small lock at Vischer's Ferry, costing $185,506.69, nor on account of the construction of highways in the place of highways destroyed by reason of the canal work, the payments made on this account being $461,241 additional, or a



BARGE CANAL, CONTRACT NO. 65.
View along the face of the high retaining wall, where the canal alignment circles the gorge at Medina.

UNIV. OF MICH.

total expenditure to December 1, 1913, for construction, of $64,800,656.69.

In conclusion and in recapitulation, I therefore beg to report relative to the Barge canal improvement as follows:

Settlements have been made for about one-half the area of lands appropriated at a cost to the State of approximately $5,000,000.

Claims for damages by reason of destruction of water powers have been filed against the State amounting to approximately $28,000,000. One settlement, with interest, on account of the destruction of water power amounted to $388,000, while the total amount estimated for damage to water powers in 1903 was but $188,500.

The cost of railroad bridges to be paid by the State cannot be estimated in view of the lack of knowledge as to the extent of the liability of the State for the erection of such structures.

The cost of engineering will approximate very closely 10 per cent of the amount of construction work performed.

The total cost of the construction work necessary to be performed in connection with this improvement will be approximately $86,000,000.

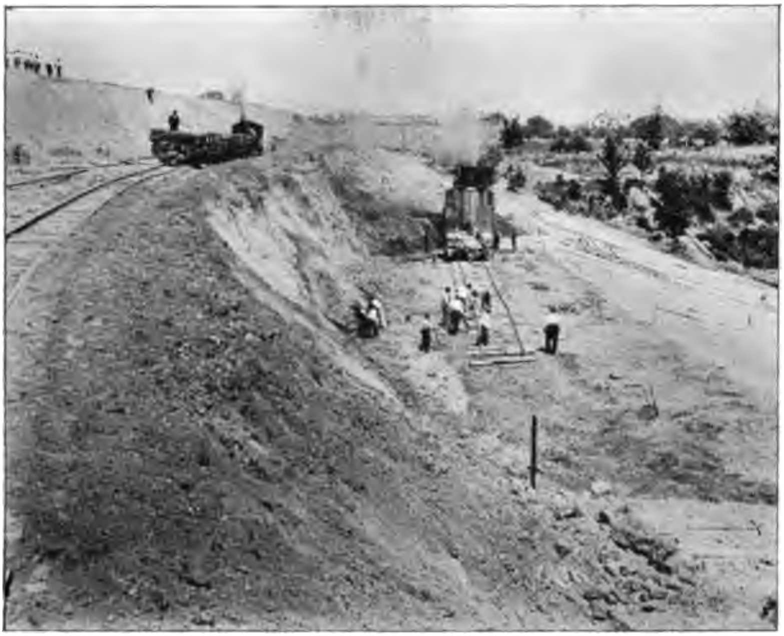
I therefore desire to place before the Legislature the following brief statement showing the relation of the 1903 estimate for construction to the estimate of cost now prepared.

1913 estimated cost of construction of Barge canal			$86,173,464
1903 estimated cost of construction, same section		$77,572,906	
To which should be added increased cost due to added burdens as follows:			
Widening locks 28 ft. to 45 ft. Canal Board, July 27, 1905	$2,445,000		
Change in line, Fox Ridge westerly to Lyons, Chap. 710, Laws 1910	1,452,268		
Change in prism, Lockport to Tonawanda, Chapter 710, Laws 1910	1,718,820	5,616,088	
1903 estimate, plus added burdens			83,188,994
Estimated increased cost above 1903 estimate and added burdens			$2,984,470

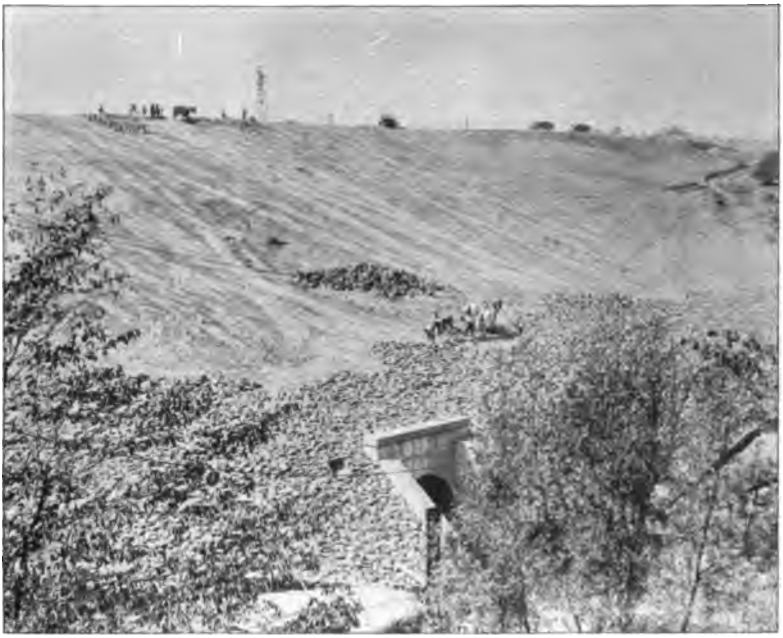
In addition to the added burdens specifically enumerated above, the cost of the work has been materially increased by the enforcement of the eight-hour labor law, and it may be noted further that the 1903 estimate for operating machinery was entirely inadequate, the cost of such machinery exceeding the estimate then prepared by approximately $2,000,000; that the estimate for the improvement of section 1 of the Champlain canal was deficient in an amount approximating $3,000,000; that the cost of unforeseen work in the western division, at the site of the Scotia dam and the dams along the Mohawk river and at other points along the canal has entailed an expense of approximately $2,000,000. Briefly stated, the work necessary to meet unforeseen conditions, erroneous estimates, etc., is in the neighborhood of $7,000,000.

I therefore wish to repeat again the statement made in my report of 1912, that the cost of construction covering these sections contemplated to be improved in the 1903 estimate will approximate very closely the amount estimated at that time. Further, I have no hesitation in stating again that seldom if ever has a work approximating the magnitude of the Barge canal improvement been carried to completion at a final cost for construction so near to that originally estimated as will be the result on the Barge canal work, now nearing completion. As noted elsewhere in this report no definite figure can be placed of the amount which must be paid by the State in settlement on account of the appropriation of lands and waters in connection with this improvement. It should be borne in mind that notwithstanding the expenditure for this item the State will as a result of such investment be in possession of valuable property which will be a material asset to the State, the exact value of which cannot at this time be estimated.

In this connection I wish to call attention again to that portion of the report of 1912 and also to this report wherein attention is called to the provisions of the Conservation Law providing the monies derived from the sale of power created as a result of the Barge canal improvement shall be turned into the general fund of the State treasury. All of such monies should properly, I believe, be applied toward defraying the expense incurred in this improvement in making such water power development possible, and also any future revenue should be applied toward the expense of operating the Barge canal system.



Manipulating material in widening embankment at the Holley trough.



Embankment at culvert No. 65, under Holley trough, widened to 3 on 1 slope and being protected with stone.

BARGE CANAL, CONTRACT NO. 62.

BARGE CANAL TERMINALS.

During the past fiscal year material progress has been made in conducting the work authorized by chapter 746, Laws of 1911, making provision for the construction of Barge canal terminals along the route of the Barge canal, in order to provide proper facilities to make possible the utilization of the canal system of the State to the best advantage.

Since the submission of my report for the fiscal year ended September 30, 1912, contracts have been entered into providing for the construction of additional terminals at Whitehall, Fonda, Ilion, Frankfort, Amsterdam, Fort Plain, Utica, Rome, Lockport, Port Henry and Plattsburg, the work on all of which is so progressing that these terminals will be completed at an early date. Plans have also been prepared for terminals at Troy, Erie Basin at Buffalo, Oswego and Watkins. Preliminary surveys and studies have been made for proposed terminals at other points along the canal, sites for terminals other than those noted having been selected by the Canal Board for the following points, Varick, Waterford, St. Johnsville, Cohoes and Ohio Basin, Buffalo.

In determining upon the terminal sites in the various localities it has been the endeavor to meet the desires of the people of the locality and at the same time provide for terminals at points which will best serve the communities having occasion to use the same and also in order to obtain the best engineering construction.

The terminal contracts awarded to date provide only for the construction of dock walls, terminal yards and necessary channel approaches to the same, no contracts as yet having been awarded providing for warehouses or the installation of freight handling devices. Studies are now being carried on with the idea of determining upon the types of warehouses and freight handling devices which can be most advantageously adopted, and at an early date contracts providing for the installation of this feature of the terminal improvement will be entered into.

At the end of the fiscal year 19 Barge canal terminal contracts were in effect, the amount of such contracts being $1,852,142.30. Upon these contracts there had been performed work to the amount of $559,410.

CANAL MAINTENANCE.

During the past year examinations have been made of the canals of the State, as directed by chapter 13 of the Laws of 1909, and plans have been prepared upon the request of the Superintendent of Public Works for making repairs to the present canal system and engineering advice furnished from time to time.

The unprecedented floods of March, 1913, caused damages which somewhat delayed the opening of the canals, but since the opening of the canals in the spring of 1913 navigation has been uninterrupted, with the exception of a slight delay caused by a leak in a culvert at Ilion, which had no relation to the new construction work now under way.

While the flood of March, 1913, was unusually severe, the new canal suffered but little, the extent of the damage being confined principally to the washing away of embankments and the filling in of channels. The structures were practically unharmed and withstood in a satisfactory manner the strain to which they were subjected.

COMPLETED CANALS.

From time to time as certain sections of the Barge canal have been completed which may be utilized in connection with the present canal system, traffic has been turned through these completed sections and they have been operated as a part of the canal system, these portions, upon completion, being under the control of the Superintendent of Public Works. There are also other portions of the canal which have been completed but are so situated that traffic cannot be turned through the prism until the entire project shall have been finished. In so far as the excavation of the prism proper is concerned not over 20 per cent of the canal excavation remains to be done.

There has been completed to Barge canal dimensions over 250 miles of the canal which can be utilized as soon as proper connection is made with the existing canals, details with respect to which are treated of in a discussion of the Barge canal work. Those sections which have been completed and placed in use have proven satisfactory in every respect.

UTILIZATION AND MANAGEMENT OF BARGE CANAL.

The advanced state of the Barge canal improvement calls for the consideration at this time of two subjects — one, the providing of proper outlets at the several termini, and the other, the operation and maintenance of the completed canal.

Canal Outlets.

In the Hudson river between Waterford and Troy, in Lake Champlain at Whitehall, in Lake Ontario at Oswego and in the Niagara river at Tonawanda waters forming the outlets to the Barge canal system are under the jurisdiction of the Federal government.

In view of the status of the Barge canal work too great emphasis cannot be laid upon the necessity for the Federal government completing without delay the necessary channels at these points, to the end that boats navigating the Barge canal may be accommodated.

The government has under way the work of deepening the Hudson river and the construction of a dam at Troy. On November 25, 1912, Col. Black reported to the Chief of Engineers his conclusions arrived at as a result of his investigation and survey of the narrows of Lake Champlain and the following recommendations were made:

> "1 — That all work should be designed to fit ultimately a project providing a width of 400 ft. and a depth of 14 ft. and no bad curves.
>
> "2 — That a 200 ft. project with 12 ft. depth of water is advisable, justifiable and requisite at this time and such a project is presented and recommended for adoption at an estimated cost of $730,000.
>
> "3 — That this project can and should be completed within three years and that an initial appropriation of $300,000 is requisite with continuing contract authorization for the balance of the project.
>
> "4 — That the work should be done under one contract or by government plant depending on prices received by competitive bidding."

The Chief of Engineers referred this report to the Board of Engineers for rivers and harbors, which Board on February 6, 1913, reported favorably on the project. On February 10, 1913, Chief of Engineers W. H. Bixby reported to the Secretary of War, concurring generally with the views of Col. Black, but recommending that further studies be made of the cut-offs at Maple bend and Chilton bend.

With reference to the outlet at Oswego, the Chief of Engineers in his report of 1912 stated: " To widen and deepen the inner harbor of the mouth of the Oswego river and to extend the deep water area further upstream by rock excavation not considered necessary or advisable under existing conditions of commerce."

The status of these two improvements at the present time, therefore, is that no definite authorization has been given for making such improvements as are necessary in order to provide proper outlets for the Barge canal at Whitehall and Oswego.

Conditions at present existing will materially change upon the completion of the Barge canal and in order to utilize to the full extent this navigation system, being constructed at the expense of New York State, it is important that boats utilizing 12 feet of water be operated and a proper channel be provided through the short stretch of the Oswego river from the end of the Barge canal to its junction with Lake Ontario and from the outlet of the Barge canal at Whitehall to deep water in Lake Champlain. The government has performed certain work in the vicinity of Buffalo, but the extent of the work which is to be performed by the Federal government at Tonawanda has not as yet been decided.

The importance of providing proper outlets at these termini of the Barge canal must be apparent, and I therefore most earnestly recommend that this matter be given consideration by the Legislature by the passage of a joint resolution urging upon Congress the taking of early action on these matters or that action be taken to bring these facts to the attention of the Federal government by such course as in the judgment of the Legislature is best, the object sought being to afford proper outlets for the Barge canal upon its completion.

Maintenance and Operation of Barge Canal.

The other subject relates to the operation of the completed Barge canal.

Pursuant to chapter 9 of the Laws of 1912 a Commission on Barge Canal Operation was appointed to investigate and report to the Legislature relative to rules and regulations for operating the Barge canal, methods to be applied in the matter of maintenance, the type or style of craft best suited to navigation, rules and regulations governing the operation of canal terminals, statutory changes necessary or desirable for the proper, efficient and economical management of the enlarged canals, also any other subject matters, the study of which might be expected to contribute to the fullest and most efficient administration of the State's waterways system to the end that the new and enlarged system of waterways might fulfill in the greatest measure possible the purpose had in mind when their construction was authorized.

This Commission submitted its report to the Legislature on January 20, 1913, but no steps have been taken toward providing for the method of operation and the management of the new canal system when completed.

The structures on the new canal are entirely different from those used on the old canal system, on which the locks were generally operated by hand and boats were propelled by animal power. All the structures on the new canal are mechanically-operated and boats to utilize the same will be power-propelled. Such conditions will require the employment by the Superintendent of Public Works, or such officials as are vested with the operation of the canal, of employees familiar with the new apparatus installed. It will also require the formulation of new laws relative to the managament of the canals and their use by navigators.

These subjects, that of providing proper outlets for the Barge canal and that of providing a proper method of maintenance and operation, in keeping with the new conditions which will prevail upon its completion, are those which vitally affect the success of the new canal and consequently the benefits to be derived by the State as a whole from its use. I believe that the enlarged canal will contribute to a great extent to the material prosperity of our commonwealth, provided it is wisely used, and to insure such proper use statutory or constitutional changes are needed so as to bring about the proper administration of the canal and a mutually beneficial and coöperative relationship between the canal and other transportation systems. With this idea in view I beg to recommend that these subjects be given the most careful consideration.

SALE OF SURPLUS WATERS.

In the use of surplus waters for power purposes at certain places on the Barge canal there are latent possibilities of great importance. Whatever legislation may be enacted concerning the disposal of this power, the interests of the State should be carefully safeguarded, not only making provision that the canal's supply is not curtailed, but also protecting the State from loss by making valuable concessions for nominal returns. In years past the granting of such concessions has deprived the State of much just revenue. Moreover, no privileges or leases should be given except for a limited time, so that readjustments may be made when values change.

In this connection I repeat what I have stated in my two former reports, calling your attention to apparent conflicting provisions of the statutes relative to the disposal of surplus waters or power created as a result of the Barge canal improvement, particularly to chapter 494 of the Laws of 1907, amending chapter 147 of the Laws of 1903, and to section 400 of the State Conservation Law, enacted by the Legislature of 1911. The latter amended statute provides that the State Conservation Commission shall have jurisdiction over the sale of such surplus waters as may be created and that the Superintendent of Public Works shall construct necessary regulating gates and appliances to properly control such waters. It is provided in this section that the funds derived from the sale of such surplus waters shall be paid into the General Fund of the State Treasury, to which provision your attention is particularly invited, in that as a matter of equity the revenue derived as a result of the expenditure of funds authorized by the people of the State of New York for the canal improvement should be properly applied toward the cancellation of the debt thereby incurred.

With this end in view such monies derived as revenue should properly be paid to the Canal Fund for the retirement of the bonds issued for canal improvement and for the payment of interest thereon.

OLD CANAL LANDS.

In my report of a year ago attention was called to the need of immediate legislation in regard to certain old canal lands, but no action was taken and, therefore, I desire again to bring this subject before you.

In certain parts of the state, notably the western section, the Barge canal follows closely the alignment of the old canal. Here the improvement becomes largely a deepening and widening of the old channel and the old canal is absorbed in the new, but in other localities there are long stretches of the old canal which will have no connection with the new channel. These were shown on a map which accompanied my last annual report. As to what is to become of these old canal lands seems not to have been definitely determined. The Barge Canal Act provides that the proceeds derived from their sale shall be applied toward defraying the expenses of the canal improvement. The State Constitution, however, prohibits the sale of any canal, but under the general statutes and consolidated laws it has been the practice of the Canal Board formally to abandon and dispose of small tracts of canal lands no longer deemed necessary for canal purposes.

This subject of abandoning these portions of the old canal and the manner of their disposal should be definitely settled, and I commend it to your attention. In this connection I desire to repeat a suggestion I made last year. In some cities and villages the conversion of old canal lands into boulevards and parks would contribute to the general welfare of the communities, and it should be made easy for such municipalities to acquire the abandoned lands. Also, in other localities it may be possible to afford railroads easy access to the new Barge canal by selling to them the old lands. This should be done, provided the railroad agrees to make and utilize the connection and pay the State a fair consideration therefor.

To another feature of this same subject I wish to call your attention. The Barge Canal Terminal Act declares that the old canal between Rome and Mohawk shall be retained as a part of the terminal system, but provides no funds for junction locks at Rome and Mohawk. This oversight should be rectified.

CHARTING BARGE CANAL WATERS.

Through the efforts of the State Engineer the Federal government was induced to chart the navigable waters of New York state in connection with its work of charting under the Lake Survey office. This department has coöperated with the Federal government in this work and certain portions of Lake Champlain and Oneida lake have been charted and published by the Federal government. Navigators using the new waterway will require charts and the plan of having them prepared by the United States Lake Survey office ensures a uniform standard similar to that used by the United States and Canadian governments.

Inasmuch as the Barge canal will be completed and in operation in the immediate future it is important and desirable that the charting of the Barge canal waters shall have been completed by the time of the opening of the canal system to navigation. It has been estimated that in order to complete the balance of the work remaining to be performed by the Federal government on this project within a period of two years the sum of $35,000 will be needed to cover the expenses incidental thereto.

The Chief of Engineers of the United States in his report to Congress has recommended that an appropriation be made for the survey and charting of the Great Lakes and the work to be performed on the natural waterways of New York state. The amount of $175,000 recommended by him includes an item for defraying expenses in connection with the Barge canal waters.

I therefore beg to invite the attention of the Legislature to the importance of the early completion of these charts, to the end that, if deemed desirable, a resolution may be passed by the Legislature of New York State, urging upon Congress the favorable consideration of the recommendation of the Chief of Engineers for the appropriation for this purpose.

These charts are issued by the Federal government and may be obtained from the United States Lake Survey Office, Detroit, Michigan, upon the payment of the required charge therefor.

POLLUTION OF BARGE CANAL WATERS.

In each of my reports of the last two years I have called attention to the need of adequate legislation for preventing the pollution of the waters of the State canal system. However, no remedial action has been taken, although the need for haste is continually growing greater. I desire, therefore, to bring this subject again to the attention of the Legislature.

The Superintendent of Public Works has been accustomed to order the cessation of any pollution of the canal waters, when such action seemed best, but he is vested with no further authority. Prior to 1903 the State Department of Health had no power to enjoin or remove sewage pollution from any state waters. In 1903 an act was passed which provided a remedy against future pollution, except that it specifically exempted municipalities and industrial plants already discharging sewage and waste into the waters of the state at the time of its enactment. A law of 1910 vested the Department of Health with further powers, which, however, fail in effective purpose, because they are limited to cases of pollution in which, after full investigation and report, there is definitely established a public nuisance or menace to health.

Thus it appears that the present statutes are inadequate fully to correct existing conditions. Therefore, I renew my former recommendation — that suitable laws be enacted, investing some department with authority to require action which shall prevent the pollution of the State's waterways. Probably it would be well for the officials chiefly interested — the Superintendent of Public Works, the State Engineer and Surveyor and the Commissioner of Health — to determine by conference the precise form which such legislation should take.

UNNECESSARY CANAL LANDS.

In progressing the Barge canal improvement it has been necessary to appropriate certain areas of lands for the purpose of depositing spoil thereon. Many of these tracts will be of no further use in connection with the canals, while others will be needed for depositing spoil thereon in maintaining the channel. Many of these tracts which will be of no further use are admirably situated, affording access to the Barge canal and at small expense could also be provided with access to railroads. The State has not determined upon any definite policy to be followed with respect to said lands and in view of their accessibility I believe that the Legislature should give careful consideration to the question with the idea in view that a policy shall be adopted along the lines of their disposition or of the State retaining title to the same and executing long term leases which will be attractive to manufacturing and business concerns. By the adoption of a policy with respect to the use of these lands I believe that the commerce of this state can be materially increased.

SURVEYS FOR PROPOSED BRANCHES OF BARGE CANAL.

By chapter 220 of the Laws of 1913, the State Engineer and Surveyor was directed to make surveys and prepare estimates with the idea of determining the feasibility and the cost of adding certain new routes to the Barge canal system. The routes to be surveyed included the abandoned Chemung canal, the Glens Falls feeder, two routes across Long Island, one extending between Jamaica Bay and Flushing Bay and the other from Newtown creek to Flushing Bay. The final reports and estimates covering these surveys are not now ready for submission to the Legislature, but a detailed report, together with estimates, will be completed at an early date and submitted to the Legislature, pursuant to the direction of the above noted statute.

CANAL EXHIBITS.

The policy of former years of exhibiting the models and charts relating to the Barge canal improvement has been continued during the past year. As a result of such exhibits, the public has been placed in possession of information relative to this improvement which, I believe, could not be brought to their attention so effectively by any other method.

The Legislature appropriated a small fund for the use of the State Fair Commission to defray the cost of exhibits of the various departments, and the State Engineer's Department was again allotted a small amount from this fund. Numerous requests for exhibits have been received from different localities, but as no State funds were available for making such exhibits, the requests could not be complied with unless those desiring the exhibits agreed to defray the cost incidental thereto. Several of the expositions desired such exhibits made on this basis, so that, in addition to the State Fair exhibit, there have been Barge canal exhibits in New York and Pittsburgh at no cost to the State.

The many requests received for such exhibits indicate the interest of the people at large in becoming familiar with the work under way intended to increase the navigation facilities of the State.

A feature of somewhat similar nature has been the giving of Barge canal lectures in different cities. During the past year I have appeared before the Chambers of Commerce or Boards of Trade of several of the cities and villages of the state and endeavored to place before them by illustrated lectures the work being carried on in the Barge canal improvement.

Funds have been appropriated for a New York State exhibit at the Panama Exposition and, to my mind, one of the most important features to be brought out in this exhibit is the work being carried on by the State of New York in the improvement of its canal system, the benefits from which will accrue not only to the State of New York but to the country at large. This is all the more important, since the entire expense is being borne by New York State.

MAPPING CANAL LANDS.

In 1910 the State began a much needed work — that of resurveying and marking the boundaries of the canal lands within what is known as the "blue line." It is important that this survey be continued without interruption, in order that complete maps, uniform in character, shall be prepared, embracing all of the canal lands of the state.

Should the State decide to dispose of any of the lands now forming a part of the present canal system at locations where they will be of no further use upon the completion of the Barge canal, such maps will show definitely the limits of the State's ownership.

The need of this work was realized long before it was undertaken, and inasmuch as many of the old land marks are being destroyed the work should be progressed to completion as rapidly as possible. Last year, due to insufficient funds having been provided, the surveys were stopped before the end of the season. This year the work has been progressed continuously since the the appropriation became available, and in order that this important work may be continued, it is recommended that the sum of $35,000 be appropriated for this purpose.

SURVEYS FOR ATTORNEY-GENERAL.

It is customary for the Attorney-General to call upon the State Engineer to make surveys and maps and furnish technical data and evidence in the defense of claims against the State, particularly such as result from alleged damages caused by the operation or construction of the canals.

It has been customary for the Legislature to appropriate $5,000 to cover the cost of this work. In some manner this item was omitted in the supply bill of 1913. The work, however, could not well be delayed and it became necessary to secure funds to cover this indebtedness at the recent extraordinary session of the Legislature.

That the necessary work may go on during the coming year without delay or embarrassment, I recommend the usual appropriation of $5,000 for this purpose.

STATE BOUNDARY LINES.

Chapter 59 of the Laws of 1909, being the State law, directs that the State Engineer shall at certain stated times examine the boundary lines of the State of New York and, in coöperation with the adjoining states, replace such monuments as may have been damaged or destroyed.

The total length of the boundary line of New York state is 1,416 miles, being divided as follows:

	Miles.
Canadian line	431
Pennsylvania line	344
New Jersey line	92.5
New Jersey around Long Island	246
Connecticut to Long Island Sound	81
Massachusetts line	50.5
Vermont line	171

At the time of the last examination of the Canadian, Vermont and Pennsylvania lines, the monuments located thereon were found to be in satisfactory condition. For many years the monuments on the Connecticut line were in poor condition, but finally agreements were entered into between the two states and the line was remonumented, this work having been completed last year.

During the fiscal year just closed the monuments on the New York-New Jersey line have been repaired, an examination made of the Massachusetts line and such of the monuments as needed attention required or restored. The detailed report of the engineers assigned to perform the work on the New Jersey line is appended hereto. The repairs to the Massachusetts line not having been completed prior to the close of the fiscal year, the detailed report embracing this work will be embodied in the annual report for the fiscal year ending September 30, 1914.

It will be necessary to make an examination of the New York-Pennsylvania boundary line during the year 1914 and repair such monuments as may have been damaged. For the purpose of defraying the expense which will be incurred in making such examinations and repairs, I recommend that an appropriation of $2,000 be made, which, with the unexpended balance of former appropriations for making examination of the State boundary lines, is deemed ample to cover all expenses connected therewith.

COÖPERATIVE SURVEY OF NEW YORK STATE.

Topographic Survey.

In accordance with an agreement signed by George Otis Smith, Director, for the United States Geological Survey, and by me as State Engineer for the State of New York, the Federal government allotted $10,000 to meet a like sum appropriated by the New York Legislature for continuing the work of the coöperative topographic survey in New York state during the season of 1913.

This important work of surveying and mapping the whole state has been in progress for about twenty years and its great value cannot be lightly estimated. Not only engineers but many others as well make use of these maps, since they may be purchased from the Government at a nominal cost and they embody accuracy, abundance of information, in detail and on a large scale, not possessed by any other map. To several State departments, such as the State Engineer's, the Highway Commission, the Conservation Commission, the Public Service Commission and the Health Department, these maps have been of particular value. To many municipal governments and various corporations and individuals they have been equally valuable.

It is unfortunate that in 1905 the Legislature failed to make appropriation for this coöperative work. Prior to that time it was customary for the State to set aside $30,000 annually, the Federal Government duplicating the amount. Since 1905 the State has voted only $10,000 each year and similar work in other states has limited the Government's resources to a like amount, efforts to have it increased to meet a proposed increase on the part of the State having failed. At the present reduced speed it will require some seven years to complete the work in this state. It is very important that this survey be finished as soon as possible and therefore I recommended that the usual $10,000 be appropriated for its continuation.

Hydrographic Survey.

As a part of the coöperative survey in this state there has been in progress since 1900 a series of stream gagings. Work of this character is also important. Without it the canal and its water supply could not have been properly designed. As the data available from the coöperative survey did not supply all the information needed for the Barge canal, it was necessary to establish a bureau of hydraulics in connection with the new waterway, the streams in the vicinity of the canal being thus especially provided for.

The record of stream gaging in this state have now extended over a sufficient number of years to make them of considerable value, and the longer their duration the greater will be their value. Not only for designing a canal are these records needed but they are essential for any hydraulic work which has to do with the utilization of streams for power or storage, and thus they become useful to several State departments, to municipalities and to the public at large. The conservation of natural resources has become a popular desideratum. Water power is one of our greatest natural resources, but its proper conservation cannot be accomplished without the reliable knowledge obtained from the gagings of streams.

It is customary to include in the records of stream gaging published in the State Engineer's annual report the data accumulated by the coöperative survey, the Barge canal hydraulic bureau, the Conservation Commission, the Board of Water Supply of New York city and various private companies and individuals, thus bringing together in one volume nearly all the gagings taken in the state.

I recommend that the usual appropriation of $1,500 be made to carry on this important work.

SURVEYS FOR STATE DEPARTMENTS AND COMMISSIONS.

In each of my reports for the past two years I have called your attention to a condition with respect to making surveys for other State departments which needed remedying, and during the session of 1912 provision was made which has relieved the difficulty and is working out to the advantage of all concerned.

It has been a policy of long standing for the State Engineer to make surveys, estimates, plans and investigations of an engineering character for such State departments and commissions as have not engineering corps of their own. From the nature of the work it is logical and proper that such service should be rendered by the State Engineer, and the result of such practice is a uniformity and completeness not otherwise obtainable. Moreover, it has been shown by instances in which bids have been submitted by private companies for performing the work that the State Engineer, because of his organized force, can do it at much less cost.

However, there has been one very objectionable feature. Generally the department or commission requesting the survey has not had funds available until after the completion of the work and it has been necessary for the Division Engineer to advance the money, thus making himself personally responsible for the expense incurred. In some cases more than a year has elapsed before he has been reimbursed. This condition has caused delays and even hardships.

In order that maps prepared as a result of surveys shall be uniform in character, it is my opinion that all surveys embracing property to be acquired by the State should be made by the State Engineer and Surveyor, and that all field books and copies of such maps should be on file in the office of the State Engineer. Furthermore, there should be placed on file in the office of the State Engineer, for reference in connection with the making of surveys in various parts of the state, copies of all maps embracing lands owned by the State, and these should be so indexed as to be readily found.

The Legislature provided $5,000 for these department surveys and the work of the past year has been done without interruptions or financial complications. I recommend that an appropriation of $4,000 be made for the ensuing year.

FIRE-PROOF DEPOSITORIES FOR STATE RECORDS.

Again, I desire to call your attention to the necessity of providing suitable fire protection for the valuable records in the State Engineer's Department, which no amount of money can replace, if once destroyed. For several years this subject has been brought to your attention, but only once to any avail. In 1910 funds were appropriated which placed fire-proof cases in the Division Engineer's office at Syracuse, but the Division Engineers' offices at Albany and Rochester and especially the State Engineer's office in the State Hall at Albany are still to be provided for. Since I mentioned this matter in my report last year, two small fires have occurred in the State Hall, the building containing the State Engineer's and the Eastern Division Engineer's offices. Fortunately no serious damage was done, but that fact promises no security for the future. No private corporation with records as valuable as those in this department would take such chances as the State is continually taking. Certain contemplated work of refiling some the records, for which an appropriation has heretofore been provided, has not been undertaken, since no suitable cases have been provided. The possible rehousing of the State Engineer's Department, which has been under consideration for some time and of which I shall speak presently, should not prevent immediate action, since cases that will serve for both temporary and permanent use may be obtained. I recommend the appropriation of $5,000 for installing this fire-proof equipment.

BUILDING FOR DEPARTMENT.

For the past ten years the greater part of the engineering force of the State Engineer's Department in Albany has been quartered in offices located in business blocks in various parts of the city, the

State Engineer's personal office, the Eastern Division Engineer's office and two small bureaus being all that the State Hall, the old home of the department, could accommodate. At the present time three outside offices are thus being rented by this department.

In addition to the inconvenience and delays incident upon such scattered offices, the State is paying for rent a considerable sum of money which, to my mind, might better be invested in a permanent State-owned building. This condition, I believe, applies not only to the State Engineer's Department but to many other State departments.

The possible saving which would result from the erection of a State-owned building I believe warrants the most careful consideration as to the advisability of the State erecting an administration building with sufficient quarters to accommodate all State departments. I understand that the State already owns property in the city of Albany which can readily be adapted to the needs of some of the State departments renting offices in the city and I recommend that this matter be given consideration by the Legislature.

If it shall be determined to provide an administration building, ample provision should be made for fire-proof depositories in which to place the valuable records of the many State departments.

BILL DRAFTING.

At the extraordinary session of the Legislature recently adjourned there was passed a law providing for a bill drafting commission. This, to my mind, is a most important adjunct to the State Legislature. Considerable delay and inconvenience has been experienced at various times in the past, due to laws having been enacted which were not drawn so as to conform with the provisions of the State Constitution, the Consolidated Laws and, particularly, the Finance Law of the State. I believe that all bills introduced in the Legislature providing for an appropriation for public improvement, should, unless they pertain particularly to some department, definitely state that the surveys and plans for the work contemplated shall be prepared by the State Engineer and Surveyor and, furthermore, that provision should be made for paying for such expense incurred by the State Engineer from the appropriation so made.

In this connection another matter of importance is the insufficiency of certain appropriations to carry into effect the intent of the law making the appropriation. In order to obviate such a condition, all bills introduced directing the performance of work or the appropriation of lands by the State Engineer should be submitted to the State Engineer, in order that a report may be submitted as to the probable amount of monies needed for the purpose contemplated.

STATE HIGHWAY COMMISSION.

At the time of my last annual report the State Engineer was by law a member of the State Highway Commission. In that report I expressed by views on the inadvisability of the Commission as then composed and suggested the advantage to be attained by placing the work under a single responsible head. Since then legislative changes have been made which vest the control of State highway work in one Commissioner of Highways.

APPENDED REPORTS.

To show in greater detail the work of the year, reports of engineers in charge of the various pieces of work are added as appendices to my report.

Engineering Expenses: Contract Work.

The first of these consists of tables giving summaries of the Engineering expenses of the Department for the fiscal year, the details of which are contained in the reports of the three Division Engineers and the Terminal Engineer. Next follow tables of contracts that have been completed during the fiscal year and then others of the contracts that are in force at its close.

Division Reports.

The Division Engineers in charge of the three divisions into which the State is divided have each made a report of all of the work performed under their respective supervisions. For Barge canal construction each division has been divided into residences, which are in charge of Resident Engineers. The reports of the Resident Engineers to the Division Engineers furnish the accounts of what has been done during the year towards the actual construction of the canal.

Barge Canal Terminals.

The report of the Terminal Engineer, under whose supervision all the work of building canal terminals is being done, gives in detail what has been accomplished in planning and constructing these necessary adjuncts to the State canal system.

Testing Laboratory for State Works.

The account of what has been done in the Testing Laboratory is contained in a report of the Resident Engineer in charge of these tests.

This laboratory is one of the bureaus of long standing in the State Engineer's Department. It is kept continually up to date and ranks among the first of testing laboratories in the land. The larger part of its work consists in cement testing, but sand testing and various special investigations and tests are also carried on. Also, the Resident Engineer in charge makes frequent inspections of concrete structures in course of erection, being called upon especially to determine the causes of defects that sometimes appear and to give expert advice as to how they should be remedied. An important branch of the laboratory work is the inspection and sampling of cement at the several mills which supply the contractors. The large quantities of cement used in Barge canal construction brought about this custom.

In addition to making tests for the State Engineer's Department this laboratory also performs similar work for the State Architect and tests the cement used in State highway work. When the highway improvement was transferred from the State Engineer's Department, certain of the testing apparatus was removed from the laboratory, but the testing of cement is still retained, though performed at the expense of the Highway Commission.

Land Bureau.

The report of the clerk in charge of the Land Bureau of the State Engineer's Department is also appended.

This is the bureau which has charge of the sale of State lands and of the custody of ancient maps and records. There are many ancient records of great value, as well as some modern ones, on file in this bureau. Occasionally it is possible to add other valuable material to this collection and whenever this can be done without cost to the State, it has been done. This bureau is maintained by the State Engineer in connection with his membership as one of the Commissioners of the Land Office. The Commissioners generally refer matters pertaining to the examination of maps to the State Engineer and for this purpose a small fund is needed. Accordingly, I recommend the appropriation of $1,000.

Many of the ancient maps and records are so old and are referred to so often that they are fast being destroyed. They are too valuable to be thus lost, and, accordingly, I recommend the appropriation of $1,000 for publishing copies of some of them, which will both save the originals and permit a wider use of the information they contain.

Bureau of Hydraulics.

The report of the engineer in charge of the Bureau of Hydraulics is added as an appendix, but is printed in a supplement volume. This custom is again followed, because it permits an earlier publication of the State Engineer's personal report and all the other appendices. If this separation were not made, the time required in compiling, computing and publishing the hydraulic tables would delay the whole report.

There has been a bureau of hydraulics in the Barge canal office since 1906. In addition to the gaging of the flow of streams — the work which furnishes the chief subject of the annual report of the bureau — the duties of the bureau include the investigations and reports on special hydraulic problems in connection with Barge canal construction and the preparation of defense for the State in hydraulic and similar cases before the State Board of Claims.

The records which comprise the hydraulic report are of great value for reference and for all works involving the streams of the State. To make the volume as complete as possible the records of gagings taken by the hydraulic bureau are supplemented by those taken coöperatively by the State and the United States Geological Survey, by those furnished through the courtesy of the State Conservation Commission and the Board of Water Supply of the City of New York and by others obtained from various corporations and individuals.

Other Reports.

Three other reports will be found among the appendices.

One describes the work of repairing and restoring certain monuments on the New York-New Jersey boundary line.

Another is made by the Director of the United States Geological Survey and tells of the progress made during the year in the coöperative topographic survey of the State.

In the State Engineer's annual report of 1905 there was reprinted a Government bulletin which gave the results of spirit leveling in New York State under the Geological Survey from 1896 to 1905. A similar bulletin, covering the work from 1905 to 1911, has recently been published. By permission of the Director this later work is reprinted in the present volume.

ACKNOWLEDGMENT.

Acknowledgment should be made to the engineers under my charge, especially to my Deputies and Division Engineers, for faithfulness in assisting me to carry on the work of the Department.

During the year Mr. Arnold G. Chapman has served as Deputy State Engineer, while the Barge canal has been in charge of Mr. Alexander E. Kastl, and the terminal work under the supervision of Mr. John A. O'Connor. Mr. Dwight B. LaDu has been at the head of the Eastern Division; Mr. Edwin Styring of the Middle Division, and Mr. Edward J. Govern of the Western Division.

Respectfully submitted,

J. A. BENSEL,

State Engineer and Surveyor.

Engineering Expenses for the Fiscal Year Ended September 30, 1913

Table of Contracts Completed During the Fiscal Year Ended September 30, 1913

Table of Contracts Pending September 30, 1913

Roster of Employees in Office of State Engineer and Surveyor

Engineering Expenses for Fiscal Year Ended September 30, 1913.

Ordinary Repairs to Canals.

WORK.	Act.		Division.	Amount.	Total.
	Chap.	Year.			
Erie canal	546	1912	Eastern	$7,919 07	$12,000 00
Champlain canal	546	1912	Eastern	4,080 93	
Erie canal	546	1912	Middle	$8,710 83	9,000 00
Black river canal	546	1912	Middle	289 17	
Erie canal	546	1912	Western	$9,078 06	9,078 06
Total	....	......	....	....	$30,078 06

Construction of Barge Canal.

WORK.	Act.		Division.	Amount.	Total.
	Chap.	Year.			
Head office account	147 82	1903 1912	Eastern	$305,507 98	$626,224 98
Erie canal	147 82	1903 1912	Eastern	226,036 97	
Champlain canal	147 82	1903 1912	Eastern	94,680 03	
Erie canal	147 82	1903 1912	Middle	$178,754 20	347,725 26
Oswego canal	147 82	1903 1912	Middle	104,955 25	
Cayuga and Seneca canal	391 214 339	1909 1911 1911	Middle	64,015 81	
Erie canal	147 82	1903 1912	Western	$272,556 22	272,556 22
Total	....	......	....	....	$1,246,506 46

Bureau of Bridges.

WORK.	Act.		Division.	Amount.	Total.
	Chap.	Year.			
Bureau of bridges	811 791	1911 1913	Eastern	$824 17	$824 17

Special Work.

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Building dikes, Delaware river, at Port Jervis	537	1912	Eastern	$918 81	
Construction of docks at port of New York	547	1912	Eastern	560 10	
Improvement of Mohawk river and West Canada creek	132 245	1911 1913	Eastern	3,023 86	$4,502 77
Dominick street bridge, Rome	877	1912	Middle	$1,419 36	
Improvement of Weigh-lock building, Syracuse	524	1910	Middle	60 00	
Repairs to Willard dock	728	1913	Middle	28 21	
Main street bridge, Boonville	53	1912	Middle	654 32	
Lyons Falls bridge, Lyons Falls	510	1912	Middle	1,605 58	
Repairs to Owasco outlet	654	1913	Middle	432 64	4,200 11
Chadakoin river improvement	758	1913	Western	$1,909 18	
Chemung river improvement	732	1913	Western	529 23	
Canisteo river improvement	750	1913	Western	1,622 30	
Ellicott creek improvement	824	1913	Western	1,163 64	
Bergholtz creek improvement	729	1913	Western	393 49	5,617 75
Total	....	......	....	....	$14,320 63

Special Surveys.

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Canal surveys	220	1913	Eastern	$19,056 61	
Surveys, field notes and manuscript maps	511 290	1912 1913	Eastern	5,202 27	
State Board of Claims surveys	513 811 547	1910 1911 1912	Eastern	1,275 36	
Examination of monuments and maps	513	1910	Eastern	1,052 62	
Construction of lock, Shinnecock and Peconic canal	791	1913	Eastern	1,094 64	
Dredging Peconic river	430	1913	Eastern	730 26	
Glenville — Rotterdam crossing	714	1913	Eastern	387 40	
Topographic survey	547 791	1912 1913	Eastern	9,194 55	
Hydrographic survey	547 791	1912 1913	Eastern	1,761 59	$39,755 30
State Board of Claims surveys	811 547	1911 1912	Middle	$2,360 25	
Black river survey	190 703	1911 1913	Middle	410 30	
Chemung canal survey	220	1913	Middle	4,452 11	
Surveys, field notes and manuscript maps	511 290	1912 1913	Middle	2,389 62	9,612 28
State Board of Claims surveys	811	1911	Western	$3,127 14	
Surveys, field notes and manuscript maps	511 290	1912 1913	Western	6,720 64	9,847 78
Total	....	......	....	....	$59,215 36

Construction of Barge Canal Terminals.

WORK.	Act.		Division.	Amount.	Total.
	Chap.	Year.			
Head office account	746 244	1911 1913	....	$33,323 69	
Eastern division account	746 244	1911 1913	Eastern	39,905 42	
Southern division account	746 244	1911 1913	Southern	30,238 14	
Middle division account	746 244	1911 1913	Middle	39,660 99	
Western division account	746 244	1911 1913	Western	22,457 31	
					$165,585 55

Summary of Engineering Expenses for the Fiscal Year Ended September 30, 1913.

DIVISION.	Ordinary repairs to canals.	Construction of Barge canal.	Bureau of bridges.	Special work.	Special surveys.	Construction of Barge canal terminals.	Total.
Eastern and head office	$12,000 00	$626,224 98	$824 17	$4,502 77	$39,755 30	$73,229 11	$756,536 33
Middle	9,000 00	347,725 26	....	4,200 11	9,612 28	39,660 99	410,198 64
Western	9,078 06	272,556 22	....	5,617 75	9,847 78	22,457 31	319,557 12
Southern	....	....	....	....	....	30,238 14	30,238 14
Totals	$30,078 06	$1,246,506 46	$824 17	$14,320 63	$59,215 36	$165,585 55	$1,516,530 23

TABLE OF CONTRACTS COMPLETED DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1913.

Special Work.

CONTRACTOR.	Date of contract.	Character of work.	Division.	ACT. Chap.	ACT. Year.	Appropriation.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
Lathrop, Shea & Henwood Co.	Oct. 21, 1911	The improvement of the channel and banks of the Mohawk river and West Canada creek at Herkimer	Eastern	132	1911	$75,000 00	$66,500 00	$68,479 00	$62,706 18
Aldrich & Hall, Inc.	July 23, 1912	Constructing a highway bridge over the Erie canal at Vliet street, Cohoes	Eastern	488	1912	7,000 00	5,130 00	5,710 50	5,701 72
New York Submarine Contracting Co., Inc.	Dec. 24, 1912	Constructing a pier at Quarantine station, Rosebank, Staten Island	Eastern	547	1912	22,000 00	21,500 00	20,000 00	20,000 00
Bornhorst & Miller	Dec. 23, 1912	Mathews avenue bridge, Solvay	Middle	47	1912	....	5,295 00	4,264 00	4,266 08

Construction of the Barge Canal.

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
The Ferguson Contracting Co.	April 3, 1905	Contract No. 2, Erie canal — Through Waterford to contract No. 11	Eastern	$1,022,640 00	$990,075 56	$689,687 63
Holler & Shepard	Dec. 8, 1909	Contract No. 2-E, Erie canal — Through Waterford to contract No. 11	Eastern	263,189 40	307,022 57	279,184 18
James Stewart & Co.	Jan. 20, 1912	Contract No. 5-A, Erie canal — Completing contract No. 5 from Mosquito Point to Campbell's bridge	Middle	395,285 00	326,902 30	319,350 83
Pittsburg-Eastern Co.	May 22, 1906	Contract No. 8, Erie canal — Dams and locks at Scotia, Rotterdam and Cranesville	Eastern	1,518,382 00	1,516,788 98	*993,057 74

The Fort Orange Construction Co.	May 21, 1906	Contract No. 11, Erie canal — From contract No. 2 to Mohawk river	Eastern	1,671,385 00	1,333,198 80	1,218,233 44
Penn Bridge Company	Nov. 7, 1908	Contract No. 13, Erie canal — Bridges on contracts Nos. 12 and 18	Eastern Middle	29,775 00	24,330 00	23,422 81
The United Construction Company	Dec. 20, 1906	Contract No. 16, Erie and Champlain canals — Bridges on contracts Nos. 11, 25 and 27	Eastern	70,718 90	92,955 88	89,394 14
The Scofield Company	Dec. 29, 1906	Contract No. 17, Erie canal — Dams and locks at Amsterdam and Tribes Hill	Eastern	883,926 00	842,417 68	53,794 18
Alexander Murdoch	Mar. 3, 1908	Contract No. 17, Erie canal — Dams and locks at Amsterdam and Tribes Hill	Eastern	836,220 76	812,286 46	751,351 60
Houston Barnard	Aug. 20, 1909	Contract No. 20-A, Erie canal — Little Falls to Castle creek	Eastern	499,000 00	320,678 70	320,690 94
Atlantic, Gulf & Pacific Co.	Nov. 19, 1906	Contract No. 25, Champlain canal — Comstock to Dunhams Basin	Eastern	1,849,831 00	1,707,191 80	1,542,270 70
Casey & Murray	Sept. 2, 1908	Contract No. 31, Erie canal — Through Little Falls; Rocky Rift dam	Eastern	813,800 00	831,302 28	751,341 76
The Kinser Construction Co.	Nov. 23, 1908	Contract No. 46, Erie canal — Fox Ridge to Wayne county line	Middle	1,367,583 00	842,720 92	842,688 52
Crowell-Sherman-Stalter Co.†	Nov. 30, 1908	Contract No. 47, Erie canal — Town of Galen to Lyons	Western	1,434,148 00	829,194 34	830,850 40
The Hunkin-Conkey Construction Co.	Dec. 13, 1909	Contract No. 54, Champlain canal — Lock No. 7, at Fort Edward	Eastern	232,908 00	251,370 10	223,158 51
Arthur McMullen	Oct. 19, 1908	Contract No. 55, Water-supply — Delta reservoir	Middle	1,014,525 00	945,839 55	882,772 86
I. A. Hodge & Co., Inc.	Dec. 11, 1909	Contract No. 69, Champlain canal — Lock at lower Mechanicville	Eastern	270,675 00	238,302 45	231,503 87
The United Construction Company	Mar. 1, 1910	Contract No. 75, Erie canal — Guard-gate superstructures near Spencerport, Brockport and Middleport	Western	39,525 00	42,917 00	41,027 73
Lupfer & Remick	Aug. 5, 1911	Contract No. 85, Oswego canal — Bridge over lock at Phoenix	Middle	12,783 50	13,150 50	12,097 81
Lathrop, Shea & Henwood Co.	Nov. 4, 1911	Contract No. 88, Champlain canal — Reconstruction of a portion of bridge at Schuylerville	Eastern	23,553 00	35,783 90	30,814 26
D'Olier Engineering Co.	April 12, 1910	Contract No. 90, Erie, Champlain and Oswego canals — Power-supply and operating equipment at Baldwinsville, Smiths Basin, Comstock and Whitehall locks, and operating equipment at Oswego canal locks Nos. 1, 2, 7 and 8	Eastern Middle	180,630 00	180,344 71	171,632 90
John Young	April 24, 1913	Contract No. 112, Erie canal — Steel sheet-piling on contracts Nos. 60 and 66	Western	130,500 00	120,350 00	120,519 32

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* The balance due to complete this final payment was included in judgment rendered by the Board of Claims.

† Contract terminated by the Canal Board; resolution dated June 11, 1913.

TABLE OF CONTRACTS COMPLETED DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1913—(*Concluded*).

Special Work Connected with Barge Canal Construction.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
George W. Beeman*	Oct. 25, 1912	Excavating a channel in the Hudson river south of the sloop lock at Troy	Eastern	....	$15,000 00	$14,658 24
T. M. Navagh†	April 17, 1913	Deepening the sloop lock at Troy	Eastern	$5,677 00	5,677 00	5,135 00
Crowell-Sherman-Stalter Co.	Aug. 14, 1912	Agreement — Construction of a highway on north side of canal between Stas. 6738 and 6752, adjacent to contract No. 48	Western	4,522 60	4,522 60	3,624 42
The T. A. Gillespie Co	April 25, 1912 and Nov. 21, 1912	Agreement — Construction of a highway between Peek's bridge and Port Gibson; a highway between Stas. 6973 and 6980, and between Stas. 7177 and 7185, all on south side of canal, adjacent to contracts Nos. 76 and 77	Western	23,088 78	23,088 78	22,909 04
H. S. Kerbaugh, Inc	Nov. 13, 1912	Agreement — Construction of a highway near Bushnells Basin, adjacent to contract No. 63	Western	1,324 48	1,324 48	1,324 48
Empire Engineering Corporation	May 14, 1912	Agreement — Construction of highways between Stas. 3300+15 and 3309+05, Stas. 3401+20 and 3407+80, Stas. 3408+50 and 3422+86, and Stas. 3457+05 and 3460+30, all on north side of canal, adjacent to contract No. 60	Western	1,902 34	1,902 34	1,890 14
Cleveland & Sons Co	Jan. 31, 1911	Agreement — Construction of a highway along south side of canal at various places between Stas. 3574 and 3843, adjacent to contract No. 61	Western	7,267 70	7,267 70	6,957 38
Cleveland & Sons Co	Oct. 11, 1910	Agreement — Construction of a highway connecting bridges 105 and 106, on north side of canal, adjacent to contract No. 61	Western	3,987 10	3,987 10	3,315 63
Empire Engineering Corporation	....	Agreement — Construction of a highway around north approach to Young's bridge, adjacent to contract No. 66	Western	2,069 00	2,069 00	2,099 88

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* Work done by authorization of the Canal Board and according to an agreement entered into between George W. Beeman and the Superintendent of Public Works. Engineering work performed by representatives of this department.

† Work done by authorization of the Canal Board and in accordance with the contract awarded to T. M. Navagh by the Superintendent of Public Works. Engineering work performed by representatives of this department.

TABLE OF CONTRACTS PENDING, SEPTEMBER 30, 1913.

Special Work.

CONTRACTOR.	Date of contract.	Character of work.	Division.	ACT.		Appropriation.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1913.
				Chap.	Year.				
John Cuff	July 7, 1913	Construction of a flood protection along the Delaware river at Port Jervis	Eastern	531	1912	$35,000 00	$30,354 00	$31,351 20	$24,500 00
State Highway Construction Co	July 30, 1913	Completing the improvement of the channel and banks of the Mohawk river and West Canada creek at Herkimer	Eastern	245	1913	60,000 00	52,940 00	50,240 00	2,250 00
Lupfer & Remick	July 24, 1912	Constructing a highway bridge over Black River canal at East Dominick street, Rome	Middle	877	1911	....	22,790 50	19,874 00	*16,821 00
Joseph H. Conners	Aug. 27, 1913	Repairs to dike south of Fulton	Middle	515	1913	....	10,012 00	10,995 00	*7,353 00

Construction of the Barge Canal.

Chapter 147, Laws of 1903; Chapter 391, Laws of 1909; and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1913.
Empire Engineering Corporation	April 18, 1905	Contract No. 1, Champlain canal — Hudson river, Northumberland to Fort Miller and Crocker's Reef to Fort Edward	Eastern	$619,846 00	$580,423 57	$474,400 00
Sundstrom & Stratton	April 4, 1905	Contract No. 3, Champlain canal — Fort Miller to Crocker's Reef	Eastern	760,576 00	657,273 08	633,290 00
The Foundation Co.†	July 6, 1912	Contract No. 8-A, Erie canal — Lock No. 8 and substructure of dam No. 4 at Scotia, and completion of locks and dams at Rotterdam and Cranesville	Eastern	888,363 00	876,167 25	290,860 00

* Payments to September 30, 1913.

† Relet to complete former contracts.

TABLE OF CONTRACTS PENDING, SEPTEMBER 30, 1913 — (*Continued*).

Construction of the Barge Canal — (Continued).

Chapter 147, Laws of 1903; Chapter 391, Laws of 1909; and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1913.
The T. A. Gillespie Co.	Dec. 14, 1911	Contract No. 10-A, Oswego canal — From Broadway bridge, Fulton, south to contract No. 39	Middle	$103,058 00	$174,513 90	$158,800 00
Oswego Construction Co., Inc.	Mar. 4, 1912	Contract No. 10-B, Oswego canal — From the upper end of lock No. 2, Fulton, north to contract No. 37	Middle	515,044 00	516,336 05	465,620 00
James Stewart & Co.	Sept. 23, 1907	Contract No. 12, Erie canal — Oneida lake to Mosquito Point	Middle	3,082,560 00	3,563,331 49	2,833,570 00
Acme Engineering & Contracting Co.	Sept. 10, 1907	Contract No. 14, Erie canal — Mohawk river, Crescent to Rexford Flats aqueduct; dams at Crescent and Mindenville; dams and locks at Vischer's Ferry, Canajoharie, Yosts and Fort Plain	Eastern	2,875,570 00	2,985,224 72	2,588,500 00
John Henkes	Oct. 26, 1912	Contract No. 14-A, Erie canal — Clearing lands along Mohawk river, dam No. 2 to Rexford Flats	Eastern	4,765 00	4,046 00	3,560 00
Great Lakes Construction Co.	Nov. 26, 1906	Contract No. 19, Erie canal — Sulphur Springs guard-lock to Ellicott creek	Western	1,038,245 00	891,400 91	781,440 00
S. Pearson & Son, Inc.	Aug. 2, 1909	Contract No. 20-B, Erie canal — Mohawk river, Mindenville to Canajoharie	Eastern	848,540 00	1,032,210 20	762,890 00
American Pipe & Construction Co.	Aug. 18, 1909	Contract No. 20-C, Erie canal — Mohawk river, Canajoharie to Yosts	Eastern	570,600 00	607,035 00	622,200 00
American Pipe & Construction Co.	Aug. 18, 1909	Contract No. 20-D, Erie canal — Mohawk river, Yosts to Rexford Flats	Eastern	2,260,000 00	2,698,392 40	1,087,680 00
Lane Brothers Co.	April 7, 1910	Contract No. 21, Erie canal — Genesee river to near N. Y. C. & H. R. R. R. bridge	Western	1,475,900 00	1,320,103 68	936,150 00
M. Fitzgerald	Sept. 24, 1910	Contract No. 22, Erie canal — Bridges on part of contract No. 12	Middle	107,126 00	127,936 80	78,800 00
Lupfer & Remick	Aug. 8, 1912	Contract No. 22-A, Erie canal — Bridge at Weedsport	Middle	24,916 00	27,009 20	21,630 00
Millard & Lupton Co.	Aug. 18, 1909	Contract No. 23, Erie canal — Kings Bend to Genesee river	Western	2,166,600 00	1,824,388 60	1,181,410 00
Kingsbury Construction Co.	Nov. 1, 1911	Contract No. 24, Champlain canal — Guard-gate at Crocker's Reef	Eastern	46,692 00	44,368 00	37,150 00
The Kinser Construction Co.*	Nov. 23, 1906	Contract No. 27, Champlain canal — Dunhams Basin to Fort Edward	Eastern	998,920 00	723,268 61	378,650 00
Holler & Shepard †	Dec. 1, 1910	Contract No. 27-A, Champlain canal — Dunhams Basin to Fort Edward	Eastern	409,455 00	486,464 25	342,110 00

Maryland Dredging & Contracting Co.	April 3, 1909	Contract No. 29, Erie canal — Sterling creek to Herkimer-Oneida county line	Eastern	812,350 00	691,250 36	483,130 00
Acme Engineering & Contracting Co.	July 16, 1909	Contract No. 30, Erie canal — Mohawk river, Little Falls to Sterling creek	Eastern	2,650,500 00	2,681,761 12	1,950,250 00
Gilmour-Horton-Allen Co.	Sept 16, 1907	Contract No. 35, Oswego canal — Through Oswego	Middle	752,760 00	723,632 14	668,030 00
Henry P. Burgard	Dec. 9, 1910	Contract No. 37, Oswego canal — Between Fulton and Oswego	Middle	1,992,220 00	2,500,118 76	1,836,860 00
Salladin & Henrick	Nov. 29, 1912	Contract No. 37-R, Oswego canal — Moving cemetery from site of contract No. 37	Middle	5,333 30	4,890 80	3,660 00
James Stewart & Co.	April 15, 1910	Contract No. 39, Oswego canal — Three River Point to Fulton	Middle	972,900 00	1,047,786 30	390,120 00
The United Engineering & Contracting Co.	Nov. 27, 1908	Contract No. 40, Erie canal — Locks at Lockport to Sulphur Springs guard-lock	Western	2,516,743 00	2,237,255 66	2,086,100 00
Grant Smith & Co. & Locker	Feb. 24, 1913	Contract No. 42-A, Erie canal — Herkimer-Oneida county line to Oriskany road	Middle	1,033,037 85	1,014,671 83	200,480 00
The M. A. Talbott Co.	Oct. 15, 1909	Contract No. 43, Erie canal — Oriskany road to Mud creek	Middle	1,529,885 00	1,448,985 05	597,200 00
Scott Brothers	Jan. 8, 1910	Contract No. 44, Erie canal — Mud creek to contract No. 4	Middle	1,926,093 00	1,730,867 35	1,157,990 00
Crowell-Sherman-Stalter Co.	Dec. 29, 1910	Contract No. 48, Erie canal — Near N. Y. C. & H. R. R. R. crossing at Lyons to near West Shore R. R crossing at East Newark	Western	1,626,811 50	1,679,265 95	1,231,910 00
American Pipe & Construction Co.	Feb. 21, 1910	Contract No. 49, Erie canal — Palmyra to Wayne-Monroe county line	Western	765,679 00	735,279 75	644,180 00
Buffalo Dredging Co.	Sept. 23, 1910	Contract No. 50, Water-supply — Dam across West Canada creek at Hinckley	Middle	1,076,000 00	971,768 52	530,580 00
The Alto Construction Co.	Dec. 23, 1910	Contract No. 51, Water-supply — Feeder from Trenton Falls on West Canada creek to Nine-Mile creek	Middle	424,710 00	400,227 33	231,690 00
Flood & Van Wirt Co.	Sept. 26, 1912	Contract No. 56, Champlain canal — Improvement of Glens Falls feeder	Eastern	317,638 50	361,746 30	216,560 00
New York State Dredging Co.	Aug. 6, 1912	Contract No. 57, Erie canal — Through Onondaga lake outlet	Middle	85,625 00	93,596 00	61,120 00
Empire Engineering Corporation	Aug. 6, 1908	Contract No. 60, Erie canal — Near South Greece to near Adams Basin	Western	1,267,301 00	1,484,803 42	1,308,740 00
Cleveland & Sons Co.	Oct. 13, 1908	Contract No. 61, Erie canal — Near Adams Basin to Monroe-Orleans county line	Western	1,000,219 00	1,180,853 35	1,014,710 00
I. M. Ludington's Sons, Inc.	Aug. 11, 1910	Contract No. 62, Erie canal — Monroe-Orleans county line to Eagle Harbor	Western	2,151,470 00	2,662,644 59	2,649,500 00
H. S. Kerbaugh, Inc.	June 3, 1910	Contract No. 63, Erie canal — Wayne-Monroe county line to Kings Bend	Western	2,184,083 00	2,661,377 06	2,279,160 00
Empire Engineering Corporation	Aug. 6, 1908	Contract No. 64, Erie canal — Near Prospect street, Medina, to near Gasport	Western	1,207,930 00	1,339,265 78	1,053,740 00
Maryland Dredging & Contracting Co.	Mar. 26, 1913	Contract No. 65, Erie Canal — Contract No. 9 to near Prospect street, Medina	Western	1,131,523 00	1,000,098 45	226,810 00

*Suspended by order of the Canal Board.

† Relet to complete former contracts.

TABLE OF CONTRACTS PENDING, SEPTEMBER 30, 1913 — (*Continued*).

Construction of the Barge Canal — (Concluded).

Chapter 147, Laws of 1903; Chapter 391, Laws of 1909; and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1913.
Empire Engineering Corporation	Sept. 22, 1908	Contract No. 66, Erie canal — Near Gasport to near locks at Lockport	Western	$751,039 00	$852,804 61	$773,890 00
Larkin & Sangster	Sept. 3, 1910	Contract No. 67, Erie canal — Locks at Lockport	Western	1,290,880 00	1,181,727 86	1,001,200 00
Shanley-Morrissey, Inc.*	Jan. 11, 1910	Contract No. 70, Champlain canal — Hudson river, Waterford to lock No. 1	Eastern	749,300 00	779,636 50	236,240 00
Central Dredging Co.†	Oct. 22, 1912	Contract No. 70-A, Champlain canal — Hudson river, Waterford to lock No. 1	Eastern	790,488 00	759,158 88	44,380 00
Shanley-Morrissey, Inc.*	Jan. 11, 1910	Contract No. 71, Champlain canal — Hudson river, lock No. 1 to lower Mechanicville	Eastern	1,502,100 00	1,561,119 00	821,960 00
P. McGovern & Co.†	Jan. 16, 1913	Contract No. 71-A, Champlain canal — Hudson river, lock No. 1 to lower Mechanicville	Eastern	1,017,625 03	1,286,389 06	318,830 00
Shanley-Morrissey, Inc.*	Dec. 14, 1909	Contract No. 72, Champlain canal — Hudson river, lower Mechanicville to Stillwater	Eastern	1,439,733 00	1,221,111 75	618,900 00
James Stewart & Co., Inc.†	Mar. 27, 1913	Contract No. 72-A, Champlain canal — Hudson river, lower Mechanicville to Stillwater	Eastern	1,396,585 50	1,534,003 25	382,950 00
The T. A. Gillespie Co.	Dec. 23, 1910	Contract No. 76, Erie canal — Near West Shore R. R. crossing at East Newark to about one-half mile east of Port Gibson	Western	1,504,776 00	1,491,880 10	1,367,470 00
The T. A. Gillespie Co.	Dec. 23, 1910	Contract No. 77, Erie canal — About one-half mile east of Port Gibson to about one-half mile west of Palmyra.	Western	1,790,672 50	1,701,807 55	1,562,020 00
Groton Bridge Co.	Dec. 7, 1910	Contract No. 82, Erie canal — Highway bridge superstructures within the limits of contract No. 21	Western	27,235 00	28,841 50	21,320 00
Lathrop, Shea & Henwood Co.	Sept. 23, 1911	Contract No. 86, Erie canal — Reconstruction of a portion of bridge at Canajoharie	Eastern	41,871 00	43,440 00	38,180 00
P. B. McCaghey & Co.	Feb. 17, 1913	Contract No. 87, Erie canal — Bridge near Rocky Rift dam, on contract No. 20-A	Eastern	10,900 00	11,202 50	7,100 00
Owego Bridge Co.	May 28, 1912	Contract No. 89, Erie canal — Highway bridges between Lyons and Palmyra	Western	65,116 00	59,616 00	18,630 00
Lupfer & Remick	Aug. 8, 1912	Contract No. 90-A, Oswego canal — Power-plants at locks Nos. 1, 2, 7 and 8	Middle	64,840 00	64,020 20	22,440 00
The Hollington Co.	Jan. 5, 1911	Contract No. 91, Erie canal — Hydro-electric power-plant at Crescent dam	Eastern	44,600 00	44,985 50	38,840 00

MacArthur Bros. Co. & Lord Electric Co.	Feb. 17, 1913	Contract No. 92, Erie and Champlain canals — Power-plants, electrical equipment, etc., for Erie canal locks Nos. 2 to 19, inclusive, Champlain canal locks Nos. 1 to 8, inclusive, and guard-gate on contract No. 11	Eastern	1,244,940 00	1,178,976 00	25,440 00
MacArthur Bros. Co. & Lord Electric Co.	Aug. 12, 1913	Contract No. 93, Erie and Oswego canals — Power-plants at Erie canal locks Nos. 20, 21, 22, 23 and 25 and New London junction lock, and Oswego canal locks Nos. 3, 5 and 6	Middle	393,701 00	379,693 50	400 00
MacArthur Bros. Co. & Lord Electric Co.	Feb. 17, 1913	Contract No. 94, Erie canal — Power-plants, electrical equipment, etc., for the locks on the Western Division	Western	461,300 00	433,380 90	22,330 00
W. J. Burns Co.	Sept. 12, 1913	Contract No. 100, Erie and Oswego canals — Bridges over Erie canal at Long Branch and Belgium and over Oswego canal at Hinmansville	Middle	181,923 00	179,031 00	0 00
Barrally & Ingersoll	Aug. 8, 1912	Contract No. 101, Erie canal — Bridge at Three Rivers	Middle	44,590 50	40,983 50	23,730 00
Lupfer & Remick	Feb. 20, 1913	Contract No. 102, Erie canal — Bridge at Howland island	Middle	25,035 00	25,993 00	0 00
Barrally & Ingersoll	Dec. 10, 1912	Contract No. 103, Oswego canal — Bridge at Phoenix	Middle	185,655 00	197,995 00	20,610 00
R. B. Murdock	Mar. 5, 1912	Contract No. 104, Oswego canal — Bridge at Broadway, Fulton	Middle	45,580 00	39,370 00	34,190 00
Skene & Richmond	April 10, 1912	Contract No. 105, Erie canal — Five lift-bridges, from Spencerport to Gasport	Western	253,010 00	259,355 00	246,640 00
Jackson L. Richmond	Feb. 19, 1913	Contract No. 107, Erie canal — Lift-bridge and a fixed bridge at Little Falls	Eastern	121,471 30	127,707 30	4,380 00
Wm. J. Dowdle	April 15, 1913	Contract No. 113, Erie canal — Furnishing and delivering lumber and wooden piles at Bushnell's Basin and Holley	Western	26,452 00	21,964 00	20,770 00
Scott Brothers	Dec. 30, 1910	Contract A, Cayuga and Seneca canal — Lock No. 1 and dam No. 1, near Cayuga	Middle	303,133 50	376,233 50	300,520 00
Crowell-Sherman-Stalter Co.	Dec. 29, 1910	Contract B, Cayuga and Seneca canal — Dredging Seneca river, Montezuma to Cayuga lake, Cayuga lake to Seneca Falls, Waterloo to Seneca lake	Middle	1,832,550 00	1,435,484 50	905,480 00
Larkin & Sangster	Jan. 11, 1913	Contract C, Cayuga and Seneca canal — Locks, dam, etc., at Seneca Falls	Middle	1,140,872 50	1,189,245 50	241,980 00
Cleveland & Sons Co.	Jan. 7, 1913	Contract E, Cayuga and Seneca canal — Lock, dam, etc., at Waterloo	Middle	319,666 50	347,216 50	23,950 00
James H. Dawes	Dec. 22, 1911	Contract H, Cayuga and Seneca canal — Dredging Cayuga lake inlet	Middle	178,237 00	216,509 90	236,560 00
The Central Dredging Co.	Sept. 23, 1912	Contract I, Cayuga and Seneca canal — Seneca lake to Montour Falls	Middle	304,330 00	215,639 00	135,820 00

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* Suspended by order of the Canal Board.

† Relet to complete former contracts.

TABLE OF CONTRACTS PENDING, SEPTEMBER 30, 1913 — (*Concluded*).

Special Work Connected with Barge Canal Construction.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1913.
Acme Engineering & Contracting Co.	Sept. 4, 1912	Agreement — Construction of a highway between Dunsbach and Forts Ferries, adjacent to contract No. 14	Eastern	$20,461 75	$20,461 75	$19,130 00
Acme Engineering & Contracting Co.	Sept. 9, 1912 June 9, 1913	Agreement — Construction of a highway known as the Rosendale road, adjacent to contract No. 14	Eastern	26,283 00	26,283 00	26,000 00
Acme Engineering & Contracting Co.	July 31, 1913	Agreement — Construction of a highway between Shaker pond and Niskayuna, adjacent to contract No. 14	Eastern	18,952 87	18,952 87	4,820 00
Henry P. Burgard	Jan. 3, 1912	Road A, adjacent to contract No. 37	Middle	4,629 00	4,629 00	1,810 00
Henry P. Burgard	Jan. 3, 1912	Road B, adjacent to contract No. 37	Middle	93,019 50	93,019 50	81,830 00
James Stewart & Co	Aug. 14, 1912	Ox creek highways, near Fulton	Middle	73,353 50	73,353 50	62,150 00
Buffalo Dredging Co	July 11, 1913	Highways adjacent to contract No. 50	Middle	41,927 00	41,927 00	34,090 00
The T. A. Gillespie Co	Nov. 21, 1912	Agreement — Construction of 2,400 lineal feet of wooden fence along highways in vicinity of Port Gibson, adjacent to contracts Nos. 76 and 77	Western	720 00	720 00	*
The T. A. Gillespie Co	June 8, 1911	Agreement — Construction of a highway on north side of canal, adjacent to contract No. 76	Western	1,699 00	1,699 00	*
H. S. Kerbaugh, Inc	Jan. 14, 1913	Agreement — Construction of a highway on west side of N. Y. C. & H. R. R. R. at Cartersville, adjacent to contract No. 63	Western	3,765 00	3,765 00	*
Cleveland & Sons Co	April 11, 1913	Agreement — Construction of a highway between bridges Nos. 111 and 112, on north side of canal, adjacent to contract No. 61	Western	3,612 80	3,612 80	*
Great Lakes Construction Co	Jan. 16, 1913	Agreement — Construction of a highway designated "Road L," on north side of canal, adjacent to contract No. 19	Western	2,898 65	2,898 65	*
Larkin & Sangster	Aug. 24, 1912	Agreement — Construction of a highway from the hollow up the hill between the hydraulic race and the street, adjacent to contract No. 67	Western	3,358 00	3,358 00	2,626 65

* Completed; final estimate being prepared.

Roster of Employees in Office of State Engineer and Surveyor.

John A. Bensel, *State Engineer.*
Arnold G. Chapman, *Deputy State Engineer.*
R. V. Somerville, *Chief Clerk.*

GRADED EMPLOYEES.

B. J. McAllister, *Private Secretary.*
M. Peckham, Jr., *Land Clerk.*
J. M. Smelzer, *Filing Clerk.*
Mabel Weinholz, *Stenographer.*
Harriett L. Davis, *Stenographer.*
Bertha Kirchner, *Stenographer.*
Henry MacFarlane, *Laborer.*
P. H. White, *Night Watchman.*

REPORT

OF THE

DIVISION ENGINEER

OF THE

EASTERN DIVISION

For the Fiscal Year Ended September 30, 1913

EASTERN DIVISION.

STATE OF NEW YORK,
DEPARTMENT OF STATE ENGINEER AND SURVEYOR,
EASTERN DIVISION.

ALBANY, *October* 1, 1913.

HON. J. A. BENSEL, *State Engineer and Surveyor, Albany, N. Y.:*

Sir.— I have the honor to submit to you herewith my annual report as Division Engineer of the Department of the State Engineer and Surveyor, for the fiscal year ended September 30, 1913.

The principal duties performed by myself and the engineering force on this division have been in connection with Barge canal construction, but in addition the amount of special work, other than Barge canal, has greatly increased during the past year. I refer to the preparation of plans and the superintending of construction on work authorized by special acts of the Legislature; also the preparation of estimates for the construction of canals in various parts of the State, as authorized by acts passed by the Legislature; the making of surveys of State properties coming under the jurisdiction of the various State departments; the preparation of maps and reports in reference to alleged encroachments on State property, which come before the Land Board; the preparation of maps and the rendering of assistance to the Attorney-General in cases before the Board of Claims in connection with leakage, etc., from the existing canals; and the mapping of canal lands. These various subdivisions, which go to form the work coming under my supervision during the past year, will be referred to more in detail in the body of this report.

CONSTRUCTION OF BARGE CANAL.

(Chapter 147, Laws of 1903, and amendatory laws.)

The Eastern Division includes the entire length of the Champlain canal, extending from Waterford to Whitehall, and that portion of the Erie canal extending from Troy to the Herkimer-

Oneida county line, which is about four miles east of Utica. The total mileage of canal, including both Champlain and Erie lying within the limits of this division, is about 190 miles.

It is estimated that $35,000,000 will have been spent when the 190 miles of canal on this division is finally completed. This amount does not include the cost of engineering, land damages or judgments rendered against the State for breach of contract, etc. The total percentage of the work completed on the Eastern Division up to October 1, 1913, is 70 per cent and the total mileage of prism completed is 123 miles.

On the Champlain canal the structures are completed, with the exception of dam No. 1 and a small portion of lock No. 1. About 51 miles of prism are completed, but only 11 miles are in actual use, being that portion between Whitehall and Fort Ann. It is expected that by May 15, 1914, the existing Champlain canal will be entirely abandoned from Whitehall to Northumberland, a distance of about 34 miles, and that traffic will pass through the Barge canal. The present status of the work on the remainder of the Champlain canal would indicate that in 1915 boats will pass through the completed Champlain canal from Whitehall to Waterford, its entire length.

On the Erie canal all of the structures are completed, with the exception of dam No. 4 and lock No. 8 at Scotia, and the contracts for the remodelling of possibly eight bridges to satisfy Barge canal conditions. About 72 miles of prism are completed, but only 4 miles are now in actual use, which is that portion of the canal between dam No. 3 at Vischer's Ferry and Rexford Flats. Due to an injunction obtained by the Half Moon Bridge Company, the State has been restrained from making the closures in the Crescent dam. As soon as this injunction is vacated, the closures can be made in the dam and navigation from dam No. 3 at Vischer's Ferry to the Hudson river at Waterford can be maintained in the completed Barge canal.

While it is the object to have the work on the Eastern Division of the Erie canal completed to such an extent that it will be possible to operate the same for its entire length at the beginning of the season of 1915, at the present time there are three possible features of the construction work that may one or all develop a condition that will render it impossible to complete the entire Erie canal on this division by the year 1915, and they are: Making the closures in the Crescent dam; completing the canal between Mindenville and Little Falls, and completing the work in the vicinity of the New York Central & Hudson River railroad crossing at Sterling creek, which is about 7 miles east of Utica.

The work of completing the construction at the Crescent dam and at Sterling creek hinge upon questions of law and this department is powerless to act in any way that will hasten the determination of the legal questions pertaining to them.

In the matter of completing the construction between Mindenville and Little Falls the questions involved are the maintenance of navigation on the existing canal and the cancellation of a Barge canal contract. While the policy has now been outlined and work is progressing on the plans for the new contract, it is doubtful if sufficient time remains to actually award the contract and complete the work by the spring of 1915.

Aside from the cases mentioned above, the present condition of the remainder of the work now under contract would tend to indicate its final completion by the spring of 1915.

While the maintenance and operation of the completed canal may not properly be considered to come within the scope of this department, the experience of the past year along the Mohawk river has brought to my attention several conditions that are so vitally important to the successful operation of the canals that I consider the mentioning of them permissible at this time.

In dredging the channel along the Mohawk river where light material is encountered, it has been practically impossible to maintain the required depth, because of the silting action which has taken place. In my opinion the only way in which this very objectionable feature is to be overcome is in protecting the banks by depositing coarse material along the slopes and by changing the section to which the prism is now being excavated, that is, to eliminate the steep slopes from the outside limits of the bottom of the prism to the existing river bed and substitute a very flat slope on either side and extend this slope to the river bank in a manner that will approximately parallel the contour of the original river bed. This will increase the quantity of excavation, but it will prevent the erosion of the unexcavated shoulder by the river and the depositing of the material in the completed channel farther downstream where it will be a hindrance to navigation. Eventually, I believe, this material must be removed, for I am convinced that the ultimate section of the canalized rivers will be as indicated above, whether they are so excavated during the actual construction or left to the action of the river itself.

The question of such material as gravel and large stones being carried by the current and deposited in a position that seriously interferes with the operation of the lock-gates or the gates and uprights of the movable dams must also be considered and, in order to insure a successful operation of these structures, certain changes should be made in the type of construction that will reduce the depositing of material to a minimum.

In connection with the operation of the lock-gates, it may happen that a stone of comparatively small dimensions is deposited by the action of the current on the miter-sill and near the quoin and an attempt is made to close the gate, with the result that the gate is forced off the pivot, with perhaps other damage to the gate and quoin. I believe the liability of injury to the gates in this manner may be overcome by constructing a sump of sufficient dimensions in front of the miter-sill, in which material carried by the current would be deposited instead of on the miter-sill.

In operating the movable dams great difficulty has been experienced in properly seating the uprights against the shoes, because of the presence of gravel, etc., which has been deposited on the sill. It can readily be seen that serious damage would result to the structure due to the fact that it was impossible to seat the uprights. I would recommend the construction of a small dam, possibly five feet high, along the sill and the location of the shoes on the crest of this dam. This would require shorter uprights and a change in the design of the gates, but it would render it impossible for material to lodge against the shoes, for at any season of the year when it would be necessary to raise or lower the uprights a sufficient amount of water would be passing over the crest of the dam to prevent any material accumulating against the shoes.

In providing for the operation and protection of the gates of the movable dams, one other feature presents itself, when considering the question from the standpoint of successfully operating the canals, namely, some provision in each of the pools that will allow boats to be safely harbored during periods of high water and thus reduce as far as possible the danger of having boats swept by the current against the substructure of the movable dams, causing damage not only to the structure but to the boats. I would recommend that in each pool a slip be excavated of sufficient dimensions and in a location that would provide a shelter for all craft that may be navigating the pool at a period of high water, where the boats may be moored until such time as the canal can be navigated without undue danger.

SPECIAL APPROPRIATIONS.

Pier at Quarantine Station.

(Chapter 547, Laws of 1912.)

Upon the plans and specifications prepared by this department, the Health Officer of the Port of New York entered into a contract with the New York Submarine Contracting Co., for the construction of a pier at the Quarantine Station. The work has been completed under the direction of engineers assigned from this division and the pier has been thrown open for use.

Improvement of the Channel and Banks of the Mohawk River and West Canada Creek at Herkimer.

(Chapter 132, Laws of 1911, and chapter 245, Laws of 1913.)

The contract awarded to Lathrop, Shea & Henwood Company for constructing the dike as provided by Chapter 132, Laws of 1911, has been completed. This dike acted as a safeguard against the flood waters of West Canada creek. It was believed that greater protection could be afforded the village of Herkimer by extending this dike farther upstream, and by the provisions of Chapter 245 of the Laws of 1913 an additional appropriation of $60,000 was made by the Legislature for this purpose. Plans and specifications were prepared by this department. The contract has been awarded to the State Highway Construction Co. and the work of extending the dike constructed under the first appropriation is now in progress.

Construction of a Flood Protection along the Delaware River at Port Jervis.

(Chapter 537, Laws of 1912.)

Plans and specifications were prepared by this department which provided for the construction of a concrete retaining wall and an earthern dike along the bank of the Delaware river at Port Jervis, to protect the city from floods. The contract for this work was awarded to John Cuff and the construction has progressed in a satisfactory manner under the supervision of engineers assigned from this division. The contract should be entirely completed by November 15, 1913.

Sloop Lock at Troy.

Upon authorization of the Canal Board the Superintendent of Public Works was directed to deepen the Sloop lock and to dredge out the channel below the lock, the Board ordering the cost of this work to be charged to the construction of the Barge canal. Plans and specifications were prepared by this department and the contract for dredging the channel below the lock was awarded to Geo. W. Beeman, and that for deepening the lock to T. M. Navagh. Both of these contracts have been completed. Engineers from this division were assigned to this work, to carry out the directions of the Superintendent of Public Works.

Improvement of Fulmer Creek.

(Chapter 791, Laws of 1913.)

By the provisions of this act certain work is to be undertaken to improve flood conditions along Fulmer creek at Mohawk. Plans and specifications have been prepared, which provide for the construction of a concrete retaining wall and an earthern dike. This contract has not as yet been advertised.

Construction of a Lock and Removal of Tide Gates on the Shinnecock and Peconic Canal.

(Chapter 791, Laws of 1913.)

Plans and specifications have been prepared by this department for the construction of a lock in the Shinnecock and Peconic canal at Good Ground, Long Island, and the removal of the existing tide gates. This contract has not as yet been advertised.

Dredging Peconic River.

(Chapter 430, Laws of 1913.)

By the provisions of this act funds are appropriated for dredging the Peconic river from the town dock at Riverhead, Long Island, to deep water in Peconic bay. Plans and specifications have been prepared covering this work, but the contract has not as yet been advertised.

Repairs to Damaged Portions of the Barge Canal Caused by the Floods of March, 1913.

(Chapter 515, Laws of 1913.)

The floods of March, 1913, caused some damage to the completed Barge canal on the Eastern Division. Plans and specifications have been prepared for a contract to repair damaged portions on the Champlain canal. It is expected that this contract will be awarded so as to allow the contractor to begin work not later than November 15, 1913.

Glenville–Rotterdam Crossing.

(Chapter 714, Laws of 1913.)

This act provides for remodelling dam No. 5 at Rotterdam, and constructing the necessary approaches, so that the structure can be used for highway purposes. Work on the plans for this contract is now in progress.

Construction of a Viaduct over the Normanskill, Albany County.

(Chapter 295, Laws of 1913.)

This act provides for the construction of a highway from the intersection of Van Vechten road with Delaware avenue in the city of Albany to connect with the improved State highway at Corning hill, a distance of about one and one-half miles, together with the construction of a viaduct to carry this highway over the Normanskill and the tracks of the Delaware and Hudson Railroad Company, the department of the State Engineer and Surveyor being charged with the preparation of plans and the awarding of the contract for building the viaduct. The necessary surveys have been made by the Department of Highways and work on the plans for the viaduct is now in progress under the supervision of engineers from this department.

CANAL SURVEYS.

(Chapter 220, Laws of 1913.)

This act provided funds to be used in making the necessary surveys and estimates to determine the cost of canals of Barge canal dimensions in various parts of the state. The work on this division included estimates on the Jamaica Bay–Flushing Bay and Newtown Creek–Flushing Bay canals, on Long Island, and the Glens Falls feeder in Warren and Washington counties. The necessary surveys have been completed and work on the estimates has progressed to such an extent that a report can be submitted to the Legislature early in 1914. A complete report, covering the details of the surveys and the estimates of cost of such canals, will be prepared in time to be printed as a part of the current annual report.

MAPPING CANAL LANDS.

(Chapter 290, Laws of 1913.)

The funds provided by this act allowed the organizing of a party to take up the work at Cohoes, where it was necessary to discontinue the survey on October 1, 1912, through lack of funds. The blue line has been mapped along the Erie canal to its junction with the Champlain canal and work is now being carried on in locating the blue line along the Champlain canal from the junction toward Mechanicville, the party at the present time working midway between Waterford and Mechanicville.

I would recommend that the incoming Legislature be asked to provide funds for the continuance of this work.

SURVEYS FOR STATE DEPARTMENTS AND COMMISSIONS.

During the year the following surveys and maps have been prepared, with the necessary reports, etc., to accompany them.

Superintendent of Prisons.

Maps have been prepared and testimony furnished relative to the cutting of timber on lands belonging to the State of New York adjacent to the prison at Dannemora.

Attorney-General.

Maps and reports have been furnished the Attorney-General in the complaints before the Land Board relative to the encroachment of the Delaware & Hudson Company on the bed of Lake George and the encroachment of the American Locomotive Company on the bed of the Mohawk river at Schenectady.

State Architect.

Topographic maps have been prepared covering the sites of the New York State Reformatory for Women at Bedford Hills, the Hospital for Deformed and Crippled Children at West Haverstraw, the New York Training School for Girls at Hudson and the Oneonta State Normal School at Oneonta.

Saratoga Reservation Commission.

Maps have been prepared in connection with the appropriation of certain lands which are to form a part of the State Reservation at Saratoga.

Board of Managers of Letchworth Village.

A map has been prepared of certain lands that are to be purchased in connection with this institution.

I would recommend that the incoming Legislature be petitioned again to place in the hands of the Comptroller a fund amounting to $5,000, so that this money will be available for salary and expenses of the men making the surveys and maps requested by other State departments and commissions.

BOARD OF CLAIMS.

An unusually large number of maps and reports have been made during the past year in connection with claims brought against the State. On claims which are connected with the existing canals the necessary surveys and maps are prepared by engineers assigned direct from this office. On claims in connection with the Barge canal the necessary maps and reports are made by the various resident engineers in charge of the Barge canal work.

Appended to this report are statements which have been prepared to show the disbursements made for salaries and expenses to carry on the work, also statements as to the status of contracts for both Barge canal work and contracts under special appropriations, which have either been completed during the past year or are still under contract. There are also attached detail reports made by the resident engineers, covering the work within the limits of the various residencies.

During this my second year as Division Engineer of the Eastern Division I have received from both you and Mr. Kastl the same consideration and counsel as during my first year, and the employees on the division, from my immediate office force down through all the grades of men employed in the actual construction work, have accorded me the same loyal coöperation as in the past, for which I am deeply grateful, and I desire to make acknowledment to those to whom the credit belongs, should the work performed on this division during the past year be entitled to commendation.

Respectfully submitted,
D. B. LA DU,
Division Engineer.

APPENDED REPORTS — EASTERN DIVISION.

Resident Engineers' Reports on Barge Canal Construction.

ERIE CANAL, RESIDENCY NO. 1.

Assistant Engineer A. R. Morse reports:

This Residency covers that portion of the Erie canal between the Congress street bridge at Troy and the lower Mohawk aqueduct at the village of Crescent, a distance of 7.4 miles, and includes within its limits contracts Nos. 74, 2-E, 11, 91 and 114 and portions of Nos. 33 and 16, besides several others that have been finished or suspended.

Mr. G. W. Stickney, Resident Engineer, has been in charge of the residency, but was transferred to the Middle Division before this report was prepared.

The greater part of work on this residency has been the preparing of final estimates.

The following are detailed reports for the several contracts on this residency.

Contract No. 74.

For excavating a channel in the Hudson river and Mohawk river and performing work incidental thereto from Sta. 146 + 65 to Sta. 171 + 90. Length, 0.48 mile.

Plans are completed and before the Canal Board but are not yet awarded.

Contract No. 2-E.

For completing the construction of the canal from the Mohawk river at Waterford to a point about one-fourth mile above the head of lock No. 3. Length, 0.91 mile. This work was put under contract for $307,022.57, on December 8, 1909, being awarded to Holler & Shepard.

E. C. Hackett has been in charge.

The construction was completed December 4, 1912, for $279,710, or 91.1 per cent of the amount for which it was placed under contract.

This contract was modified by alterations as follows:

Alteration No. 1, approved by the Canal Board June 25, 1910, changed spoil banks; improved approaches to Fourth street bridge; provided railing to protect traffic at Saratoga avenue bridge approaches; changed foundations of retaining walls below lock No. 3 to meet conditions; changed drains, etc.; provided concrete floor in prism to prevent erosion and spoil dike above lock No. 3 to protect highway; changed miter-sill anchorages to conform to new standards; provided recesses for electric cables; provided quoin plates for locks and for painting fenders.

Alteration No. 2, approved by the Canal Board December 29, 1910, provided additional drains and concrete lining for by-pass at lock No. 3 to prevent erosion; eliminated wash walls; changed pavement at Fourth street bridge approaches; provided buffer blocks in gate recesses.

Alteration No. 3, approved by the Canal Board May 18, 1911, substituted cast iron for wooden snubbing posts for better construction.

Alteration No. 4, approved by the Canal Board June 8, 1911, provided concrete lining in by-pass at lock No. 3 to prevent erosion.

Alteration No. 5, approved by the Canal Board October 11, 1911, provided stone curb and cobblestone gutter at south approach of Fourth street bridge and concrete ditch entrance at by-pass, lock No. 3.

Alteration No. 6, approved by the Canal Board November 28, 1911, substituted concrete wall for timber crib below lock No. 2 to avoid damage to bridge abutment.

Alteration No. 7, approved by the Canal Board May 22, 1912, provided guide pier above lock No. 3 and for extending guide crib and stone protection below lock No. 2; provided additional snubbing posts and for repairing wall and eliminating removal of coffer-dam in old Champlain canal and for extending time.

The final estimates have been completed and signed.

Contract No. 11.

For excavating the canal and protecting its sides from Sta. 220 (0.4 mile northwest of the D. & H. R. R. crossing at Waterford) to Sta. 305 on the Mohawk river (about 1.6 miles below Crescent), including the construction of locks Nos. 4, 5 and 6 and appertaining structures, a highway, masonry for a guard-gate, bridge abutments and other incidental details. Length, 1.6 miles.

H. C. Kline has been in charge.

This work was put under contract May 21, 1906, for $1,333,198 and awarded to the Fort Orange Construction Co.

The construction was completed April, 1913, for $1,217,100, or 91.29 per cent of the amount for which it was awarded.

This contract was modified by alterations as follows:

Alteration No. 1, approved by the Canal Board March 25, 1908, changed details of lock construction, guard-gate substructure, etc., to reduce cost.

Alteration No. 2, approved by the Canal Board October 21, 1908, changed types of wall at various points on account of poor rock; changed specifications for concrete to get better mixture.

Alteration No. 4, approved by the Canal Board September 8, 1910, changed by-pass at lock No. 6 to avoid highway.

Alteration No. 5, approved by the Canal Board July 19, 1911, eliminated snubbing posts and ladders in rock cut on account of poor foundation; provided additional snubbing posts at river entrance and additional wall at guard-gate to close gap between walls.

Alteration No. 6, approved by the Canal Board January 31, 1912, changed plans of by-pass at lock No. 6 on account of increased height of embankment.

Alteration No. 7, approved by the Canal Board July 11, 1912, eliminated wash wall on embankments — believed unnecessary.

Alteration No. 8, approved by the Canal Board September 25, 1912, provided yellow pine instead of spruce timbers, — better construction at no increased cost.

The final estimates are completed and sent to Albany to be checked.

Contract No. 16.

The portion of contract No. 16 embraced in this residency consisted of furnishing and erecting a small steel highway bridge at Sta. 293 + 70.

H. C. Kline has been in charge.

Contract No. 16 was awarded December 19, 1906, to the United Construction Company. The work included in this residency amounted to $3,422.50.

The final estimates were completed and signed. The final amount was $3,568.96.

Contract No. 114.

For constructing a guard-gate and sluice-gate at Sta. 280, Erie canal, between lock No. 6 and the present guard-gate.

Bids have been received by the Superintendent of Public Works, but the contract has not as yet been awarded.

Contract No. 91.

For building and equipping hydro-electric power plant on the Erie canal near the east end of the Crescent dam.

H. C. Kline is in charge.

Contract No. 91 was awarded to The Holington Co., on January 5, 1911, for $44,925.50.

This contract has been modified by an alteration as follows:

Alteration No. 1, approved by the Canal Board May 22, 1912, changes design of power house superstructure to conform to standard and adds item of embankment.

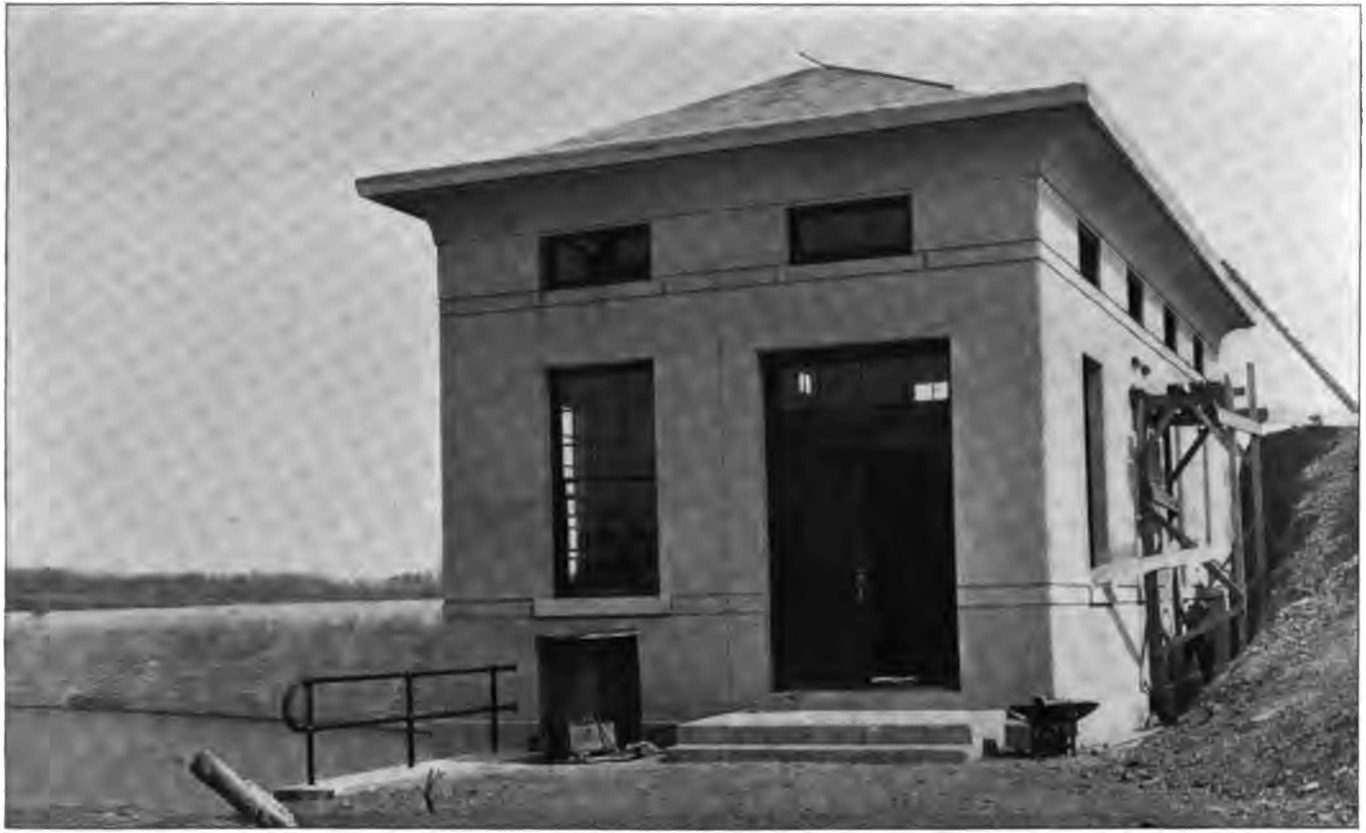
The construction is practically completed, showing 86.3 per cent, based on the preliminary estimate. There still remains a small amount of work on minor items.

The final estimate has been completed and sent to Albany.

ERIE CANAL, RESIDENCY NO. 2.

Resident Engineer S. W. Belding reports:

This residency extends from the west end of the Crescent aqueduct to old lock No. 27, near Cranesville, a distance of 32.8 miles, together with the construction of dam No. 2, near Crescent. The work performed during the year covered contracts Nos. 8-A and 14-A and a portion of contract No. 14; also the construction of three highways under agreements with the Superintendent of Public Works, and the special work of building the junction lock at dam No. 3 under direction of the Superintendent of Public Works by authorization of the Canal Board.



BARGE CANAL, CONTRACT NO. 91.
View showing power-house constructed at the east end of the Crescent dam.

Contract No. 8-A.

This contract is for the construction of lock No. 8 and the substructure of dam No. 4, at Scotia; for the completion of paving, riprap and embankment at dam No. 5 and lock No. 9, at Rotterdam, and dam No. 6, lock No. 10 at Cranesville, together with other incidental work.

Contractor, The Foundation Company.

Assistant Engineer, in charge, W. J. Weigmann.

This contract has been modified by an alteration as follows:

Alteration No. 1, approved by the Canal Board April 22, 1913, increases thickness of lock floor to withstand upward pressure; provides additional riprap below dam to prevent scour; substitutes wood for steel sheet-piling to facilitate work; lowers piers to admit shortening of dam uprights.

Dam 4, *Lock* 8, *Scotia.* At the beginning of the fiscal year the contractor had delivered and erected considerable plant, but no estimate for work done was rendered till November 1, 1912.

Although the winter of 1912–13 was extremely mild and favorable, work was suspended early in January. At this time caissons Nos. 16, 17 and 18 had been sunk to grade and caissons Nos. 19 to 24, inclusive, were down from 25 to 40 feet. General work was resumed in March and the concreting and sinking of caissons in May. To date, caissons Nos. 8 and 9 and Nos. 12 to 24, inclusive, have been completed, and Nos. 1, 4, 5, 6, 10 and 11 have been started. Caisson keys have been completed between caissons Nos. 14 and 24, inclusive.

Lock excavation was started in July and continued intermittently until about the first of September, when the contractor was ordered to stop on account of danger to the old canal.

The driving of sheet-piling to enclose the lock site was begun in August, but little piling was driven to grade except at the extreme upstream end of the lock. This work was also stopped until such time as the contractor had made the old canal bank safe.

Work on the north span of the apron was commenced in July and to date the excavation and sheet-piling are completed and concrete under water to a depth of about 2½ feet is in place.

About 100 lin. ft. of the upper guide wall has been finished to grade.

The north bridge pier has been completed to about 12 feet above low water and 80 per cent of the core wall is built.

Dam No. 5, Lock No. 9, Rotterdam, and Dam No. 6, Lock No. 10, Cranesville. No work has been done at locks Nos. 9 and 10.

The following table shows the itemized quantities of work completed:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Grading spoil banks and cleaning up. lump sum	1	0	0	0	0
Excavation . . . . . cu. yds.	74,900	10,502	10,502	14	14
Sheeting and bracing . . . . . ft. B. M.	641,000	0	0	0	0
Forming embankment . . . . . cu. yds.	38,800	0	0	0	0
Lining . . . . . cu. yds.	580	0	0	0	0
Sawed lumber, yellow pine or Douglas fir . . . . . ft. B. M.	1,000	0	0	0	0
Sawed lumber in coffer-dams . . . . . ft. B. M.	280,000	0	0	0	0
White oak lumber, in miter sills . . . . . ft. B. M.	1,400	0	0	0	0
Coffer-dam filling . . . . . cu. yds.	6,000	0	0	0	0
Foundation piles . . . . . lin. ft.	20,800	0	0	0	0
12-inch wooden sheet-piling . . . . . ft. B. M.	574,000	0	0	0	0
Second-class concrete . . . . . cu. yds.	38,900	368	368	1	1
Concrete pneumatic caisson work below elevation 148* . . . . . cu. yds.	200	534	534	267	267
Concrete pneumatic caisson work, elevation 148 to elevation 209 . . . . . cu. yds.	15,020	12,078	12,078	80	80
Concrete in apron . . . . . cu. yds.	4,050	619	619	15	15
Concrete in piers . . . . . cu. yds.	2,200	646	646	29	29
Second-class stone paving . . . . . sq. yds.	3,310	0	0	0	0
First-class riprap . . . . . cu. yds.	6,530	0	0	0	0
Second-class riprap . . . . . cu. yds.	410	0	0	0	0
Third-class riprap . . . . . cu. yds.	2,000	0	0	0	0
Fourth-class riprap . . . . . cu. yds.	320	0	0	0	0
Structural steel . . . . . lbs.	14,450	0	0	0	0
Embedded structural steel,— furnishing f. o. b. cars, Scotia . . . . . lbs.	22,000	0	0	0	0
Embedded structural steel,— hauling from cars, Scotia, and erecting in place . . . . . lbs.	22,000	0	0	0	0
Metal reinforcement . . . . . lbs.	20,900	0	0	0	0
Steel castings . . . . . lbs.	1,900	0	0	0	0
Iron castings . . . . . lbs.	10,800	0	0	0	0
Shoes and anchorages for uprights,— furnishing f. o. b. cars, Scotia . . . . . No.	34	0	0	0	0
Shoes and anchorages for uprights,— hauling from cars, Scotia, and setting in place . . . No.	34	0	0	0	0
Metal for upper gates,— furnishing f. o. b. cars, Scotia . . . . . No.	2	0	0	0	0
Upper gates,— hauling metal from cars, Scotia, furnishing all other materials and erecting upper gates complete in place . . No.	2	0	0	0	0
Metal for lower gates,— furnishing f. o. b. cars, Scotia . . . . . No.	2	0	0	0	0
Lower gates,— hauling metal from cars, Scotia, furnishing all other materials and erecting lower gates complete in place . . . No.	2	0	0	0	0
Metal for swing beams for needle dams,— furnishing f. o. b. cars, Scotia . . . . . No.	2	0	0	0	0
Swing beams for needle dams,— hauling metal from cars, Scotia, furnishing all other materials and erecting complete in place. No.	2	0	0	0	0

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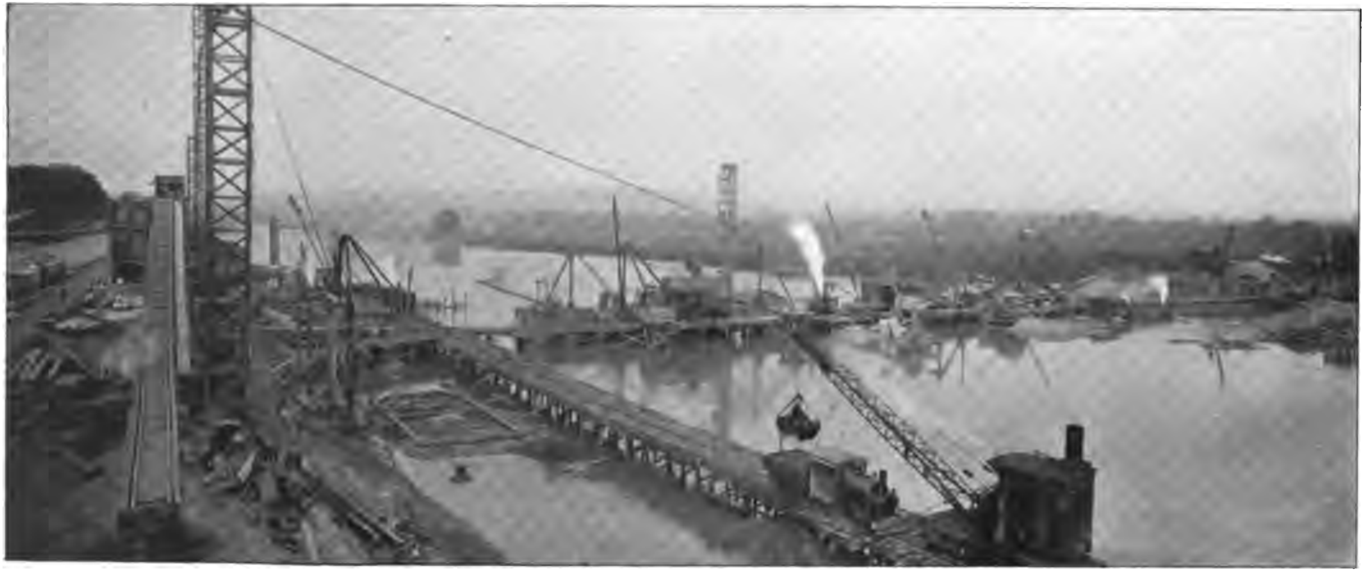
* Increase in item "concrete pneumatic caisson work below elevation 148" from 200 cu. yds. to 500 cu. yds. was approved by the Canal Board, April 22, 1913.



BARGE CANAL, CONTRACT NO. 8-A.

View showing progress in constructing the lock and movable dam at Scotia. Here it was found necessary to use pneumatic caissons for laying the foundations. The caissons for lock walls are seen near the left bank, while caissons for dam piers and sills stretch across the river.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Supports for valve seats,— furnishing f. o. b. cars, Scotia..............No.	4	0	0	0	0
Supports for valve seats,— hauling from cars, Scotia, and erecting complete in place...No.	4	0	0	0	0
Lock valves,— furnishing f. o. b. cars, Scotia, No.	4	0	0	0	0
Lock valves,— hauling from cars, Scotia, and erecting complete in place.............No.	4	0	0	0	0
Removing concrete..................cu. ft.	10,000	0	0	0	0
Pumping million ft.-gals....................	75,000	0	0	0	0

Contract No. 14, *Sections Nos.* 1 *and* 2.

Such portion of the contract as is within this residency is for dredging a channel in the Mohawk river from Crescent to Rexford Flats; constructing dam No. 2 at Crescent, dam No. 3 and lock No. 7 at Vischer's Ferry; temporary docking, etc., at Rexford Flats, highway changes and other incidental work.

Contractor, The Acme Engineering & Contracting Company.

Assistant Engineer, in charge, J. C. Bell.

This contract has been modified by alterations as follows:

Alteration No. 2, approved by the Canal Board June 11, 1908, changes lock-gates, gate recesses and lock details to conform to standard design; changes specifications for concrete to secure a better mixture.

Alteration No. 3, approved by the Canal Board September 1, 1908, provides apron and riprap protection at retaining dam at Mindenville and pile foundation for abutments, on account of soft material.

Alteration No. 5, approved by the Canal Board January 27, 1909, extends Dam C at Crescent to solid rock at each end.

Alteration No. 6, approved by the Canal Board March 31, 1909, changes foundation and abutments of movable dams to secure a better foundation; increases size of bridge members and chains to suit winches designed.

Alteration No. 7, approved by the Canal Board June 24, 1909, changes gage of tracks, track channels, etc., to suit winches designed; changes specifications for chains and miter-sills to conform to the new standard; increases certain quantities in preliminary estimate.

Alteration No. 8, approved by the Canal Board August 25, 1909, changes nosing of piers for ice protection.

Alteration No. 9, approved by the Canal Board September 22, 1909, modifies abutment of Dam A at Crescent to provide for power development for lock operation.

Alteration No. 10, approved by the Canal Board December 23, 1909, changes abutments of Dam B and extends Dam C to abutments on account of poor condition of rock.

Alteration No. 11, approved by the Canal Board September 8, 1910, permits the use of second-class concrete blocks for riprap at Yosts.

Alteration No. 12, approved by the Canal Board November 22, 1910, provides for junction lock in present canal at Vischer's Ferry.

Alteration No. 13, approved by the Canal Board April 6, 1911. eliminates portion of work provided in alteration No. 12.

Alteration No. 14, approved by the Canal Board October 11, 1911, changes plans for section E, Vischer's Ferry dam, on account of poor rock encountered.

Alteration No. 15, approved by the Canal Board February 6, 1913, provides for a junction lock at north end of Vischer's Ferry dam to allow closing of dam. Alteration No. 15 rescinded by Canal Board April 24, 1913.

Alteration No. 16, approved by the Canal Board January 13, 1913, eliminates closing of Crescent dam, etc.

Dam No. 2, Crescent. Previous to September 30, 1912, the contractor had assembled such plant and materials as were necessary to close the four 33-ft. and one 66-ft. openings previously left in the dam to pass the flow of the river. After partly closing the wide opening, an injunction against the State stopped all work at this point and the contractor removed most of his plant from the site of the work. Since that time the construction has not been resumed.

Dam No. 3, Lock No. 7, Vischer's Ferry. During the year the old bridge piers at Vischer's Ferry have been removed to grade and the excavation in the river and lower lock approach practically completed. The concrete in seven of the nine openings left in the south channel dam to pass the river flow, the excavation on the island, the dock approaches and much incidental work have all been completed during the year and with the exception of a small amount of cleaning up the contract at this point is finished. The two remaining openings left in the dam were closed under an order covering the junction lock work. The flood of March, 1913, caused some damage to the lower approach dike, which will have to be repaired.

Temporary Docking at Rexford Flats. The docking at this point and the cut through the old canal tow-path, made necessary to connect the old and new canals before the final completion of the Barge canal, were completed during the winter of 1912–13, so that navigation between Rexford Flats and dam No. 3 at Vischer's Ferry now passes through the Barge canal.

Replacing Bottom and Tow-path of Old Canal near Vischer's Ferry. A washout in the tow-path and bottom of the old canal just east of Vischer's Ferry, which occurred during the work of closing the openings in dam No. 3, had to be repaired, so that navigation could be continued a year longer in the old canal. This work was done by the Acme Engineering and Contracting Company under an extra work order during the winter of 1912–13. It consisted in the making of about 30,000 cu. yds. of embankment and the driving of about 650 lin. ft. of 6-inch sheet-piling, amounting to about $30,000.

The following table gives the itemized quantities of work done:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing . . . . . lump sum	$50	$10	$40	20	80
Grubbing . . . . . cu. yds.	2,975	0	537	0	Finished.
All excavation . . . . . cu. yds.	390,807	18,331	359,621	5	92
Sheeting and bracing . . . . . ft. B. M.	30,300	0	10,620	0	Finished.
Forming embankment, first-class . . . . . cu. yds.	108,013	2,894	97,594	3	Finished.
Forming embankment, second-class . . . cu. yds.	30,940	637	27,968	2	Finished.
Lining . . . . . cu. yds.	1,300	0	1,382	0	Finished.
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	73,960	56,080	61,010	76	Finished.
Sawed lumber, hemlock . . . . . ft. B. M.	319,100	7,980	285,750	3	Finished.
Sawed lumber, white oak (in miter-sills and lock-gates) . . . . . ft. B. M.	4,740	0	9,520	0	Finished.
Sawed lumber, white oak . . . . . ft. B. M.	68,000	3,450	61,620	5	Finished.
Sawed lumber, creosoted yellow pine or Douglas fir . . . . . ft. B. M.	14,900	0	14,360	0	Finished.
Round timber in cribs . . . . . lin. ft.	27,000	26,443	26,443	98	Finished.
Stone filling in cribs . . . . . cu. yds.	9,085	2,153	7,844	24	Finished.
Foundation piles, 16 ft., long . . . . . No.	839	0	787	0	Finished.
Foundation piles, 20 ft. long . . . . . No.	84	0	34	0	Finished.
Mooring piles, 20 ft. long . . . . . No.	40	16	33	40	Finished.
First-class concrete . . . . . cu. yds.	21,000	1,168	20,038	5	95

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Second-class concrete................cu. yds.	137,870	3,754	123,053	3	89
Reinforced concrete................cu. yds.	55	0	50	0	Finished
Wash wall................cu. yds.	3,250	16	3,002	1	Finished.
Second-class stone paving................sq. yds.	110	0	93	0	Finished.
Cobblestone paving................sq. yds.	200	0	227	0	Finished.
Ballast................cu. yds.	15	0	13	0	Finished.
Second-class riprap................cu. yds.	8,140	0	7,417	0	Finished.
24-inch vitrified pipe................lin. ft.	200	0	181	0	Finished.
Structural steel................lbs.	61,300	3,858	50,765	6	83
Metal in lock-gates................lbs.	332,000	0	327,044	0	Finished.
Metal in needle-dams................lbs.	84,000	0	62,799	0	Finished.
Metal in lock-valves................lbs.	58,400	0	56,852	0	Finished.
Metal in head-gates................lbs.	280,000	0	219,218	0	Finished.
Metal reinforcement................lbs.	9,955	0	10,842	0	Finished.
Steel castings................lbs.	7,000	0	5,765	0	Finished.
Iron castings, plain................lbs.	128,135	560	111,793	1	87
Iron castings, machined................lbs.	32,800	0	28,798	0	Finished.
Wooden fencing................lin. ft.	1,210	0	1,208	0	Finished.
Fender fastenings................lbs.	1,170	0	1,162	0	Finished.
24-in. x 36-in. sluice-valves................No.	2	0	1	0	Finished.
Machinery................lbs.	8,000	0	9,046	0	Finished.
Wrought iron pipe railing................lin. ft.	530	314	314	60	60

Contract No. 14-A.

This contract is for clearing lands along the Mohawk river from dam No. 2 to Rexford Flats. Length, about 14.2 miles.

Contractor, John Henkes.

Assistant Engineer, in charge, Ford W. Harris.

This contract has been modified by an alteration as follows:

Alteration No. 1, approved by the Canal Board February 27, 1913, eliminates clearing on certain parcels — returned to original owners.

This contract, which covers the clearing of brush, timber and buildings from an area of about 2,000 acres, was let on October 26, 1912. Owing to the mild winter of 1912–13 the work was considerably delayed, as it was difficult to reach the lower and swampy lands and still more difficult to haul out the timber and wood. The high water of March and April also caused the contractor some delay and much loss of cord wood. As a whole, the work has progressed in a satisfactory manner and is now about 88 per cent completed, the remainder, outside of the removal of a few buildings, being the odds and ends of the clearing.

Contract price, as affected by alterations........	$4,046
Completed to date..........................	$3,560
Completed to date..........................	88 per cent

Miscellaneous Work.

JUNCTION LOCK AT DAM NO. 3, VISCHER'S FERRY. An injunction against the state at Crescent prevented the carrying out of the proposed plans regarding navigation in the old canal between Crescent and Rexford Flats and it was considered necessary to construct this small lock at the north end of dam No. 3, at Vischer's Ferry. An alteration covering this work was added to contract No. 14 in January, 1913, but the time before the opening of navigation was so short that the Canal Board ordered the Superintendent of Public Works to take over this work and to push it with all possible speed. This was done, the Acme Engineering & Contracting Co. acting as employees of the Public Works Department and using their own plant with all available men and teams. The work was rushed by day and night and the lock finally completed and opened to navigation about the middle of June.

At the completion of the junction lock, and to make navigable the pool above dam No. 3, it was necessary to close the remaining two 36-ft. openings in the dam. This was done, under the same order from the Department of Public Works, by heavy stop logs temporarily, later by concrete.

Total cost of the junction lock and incidental work, about $180,000.

J. C. Bell, Assistant Engineer, had charge of this work.

HIGHWAY CHANGES. Under agreements with the Superintendent of Public Works, the Acme Engineering & Contracting Co. has completed, during the year, two pieces of highway and begun work on a third.

Assistant Engineer, in charge, F. W. Harris.

This highway improvement was necessitated by the flooding of existing roads in the pool made by the new Crescent dam and covered the following:

Dunsbach Ferry–Forts Ferry Road. About 1⅓ miles of new highway along the north shore of the Mohawk river between Dunsbach Ferry and Forts Ferry, together with the raising of grades on two shorter sections — one an intersecting road and the other a continuation of the first-mentioned highway — a total length of about 1½ miles. This road and those mentioned below were built of an earth fill, 24 feet wide at the shoulders, with a gravel wearing surface 16 feet wide and 10 inches deep at the center, with the necessary culverts, guard-rail, etc.

The road was completed during the year at a total cost of $19,400.

Rosendale Road. The raising of grade, construction of guard-rail, culverts, etc., over about one mile of old highway along the south shore of the Mohawk river between Vischer's Ferry and Niskayuna.

This highway work begun and completed during the year at a cost of $26,600.

Shaker Pond–Niskayuna Road. This is an entirely new highway nearly two miles in length, between Niskayuna and a point near Mohawk View. The new road will take the place of one between the same points, but which was on low ground nearer the south shore of the Mohawk river.

Work began about August 15 and to date the road is about 25 per cent completed. Estimated cost, about $19,000.

ERIE CANAL, MOHAWK RIVER RESIDENCY, DREDGING CONTRACTS Nos. 20-B, 20-C, 20-D AND CONTRACT No. 86.

Resident Engineer E. A. Lamb reports:

The so-called Mohawk River Residency includes contract No. 20-B, extending from Sta. 3872 + 35, the upper miter-sill of lock No. 16 at Mindenville, to Sta. 3361 + 85, the upper miter-sill of lock No. 14 at Canajoharie; contract No. 20-C, extending from the upper miter-sill of lock No. 14 at Canajoharie to Sta. 2948 + 75, the upper miter-sill of lock No. 13 at Yosts; contract No. 20-D, extending from the upper miter-sill of lock No. 13 at Yosts to deep water below the aqueduct at Rexford Flats; also contract No. 86, for the reconstruction of a portion of the bridge between the villages of Canajoharie and Palatine Bridge. The total length of this residency, or the length of contracts No. 20-B, 20-C and 20-D, combined, is 54.2 miles.

Contract No. 20-B.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board June 25, 1910, changes spoil banks to expedite work; changes time for construction of stream entrances to expedite work.

Alteration No. 2, approved by the Canal Board February 28, 1911, permits second-class concrete in place of paving at Garoga creek, equally good construction — no increase.

Alteration No. 3, approved by the Canal Board May 22, 1912, provides protection of cobblestones for banks at certain points to prevent erosion; allows concrete blocks in place of paving at Otsquaga to expedite work.

During the year, surveys of the following parcels have been made, mapped and checked and sent to the Division Engineer: Irvin Miller, 2 parcels; Mrs. D. W. Gross; Charles Bellinger; Earl Bellinger; Jay D. Wagner; William D. Allen; Mrs. Louisa Chawgo, 4 parcels; one appropriation for perpetual right to overflow lands of C. D. Smith and also three of lands of Peter F. Nellis; two release maps, one for D. N. Place and one for the New York Central Railroad, and one map for part of the D. N. Place parcel retained. With possibly one or two exceptions, all these parcels have been monumented. Reports on claims, with small location maps attached, have been prepared and forwarded to the Division Engineer, as follows: Claim No. 956-A, J. N. Lipe; No. 957-A, John Errgong; No. 781-A, Irvin Miller.

Range stakes and gages have been set and maintained for the contractors in carrying on the prism excavation. Original cross-sections ahead of the dredges have been taken, also cross-sections at the end of each month, and end of season cross-sections, where it was considered necessary.

Surveys for raising of the highway bridges over the Mohawk river at St. Johnsville and Fort Plain have been completed.

The two dipper dredges, the hydraulic disposal boat, with the pontoon line, the orange-peel dredge, the Lobnitz rock breaker, the tug-boat, one large and four small rock scows, a coal scow and one small dump scow, have worked together at the prism excavation during the year. This plant has worked between Stas. 3756 and 3478. On October 1, the prism was practically finished from Sta. 3991 to Sta. 3819. From Sta. 3819 to Sta. 3812, in the vicinity of the St. Johnsville highway bridge, there are still about 2,000 cu. yds. of loose rock and coarse material. From Sta. 3812 to Sta. 3685, the prism is practically finished; from Sta. 3685 to Sta. 3646, about 2,000 cu. yds. to be removed; from Sta. 3646 to Sta. 3600, practically finished, from Sta. 3600 to Sta. 3553, 2,000 or 3,000 cu. yds. to be excavated; from Sta. 3553 to Sta. 3525, completed; and from here on, under construction, only partially excavated.

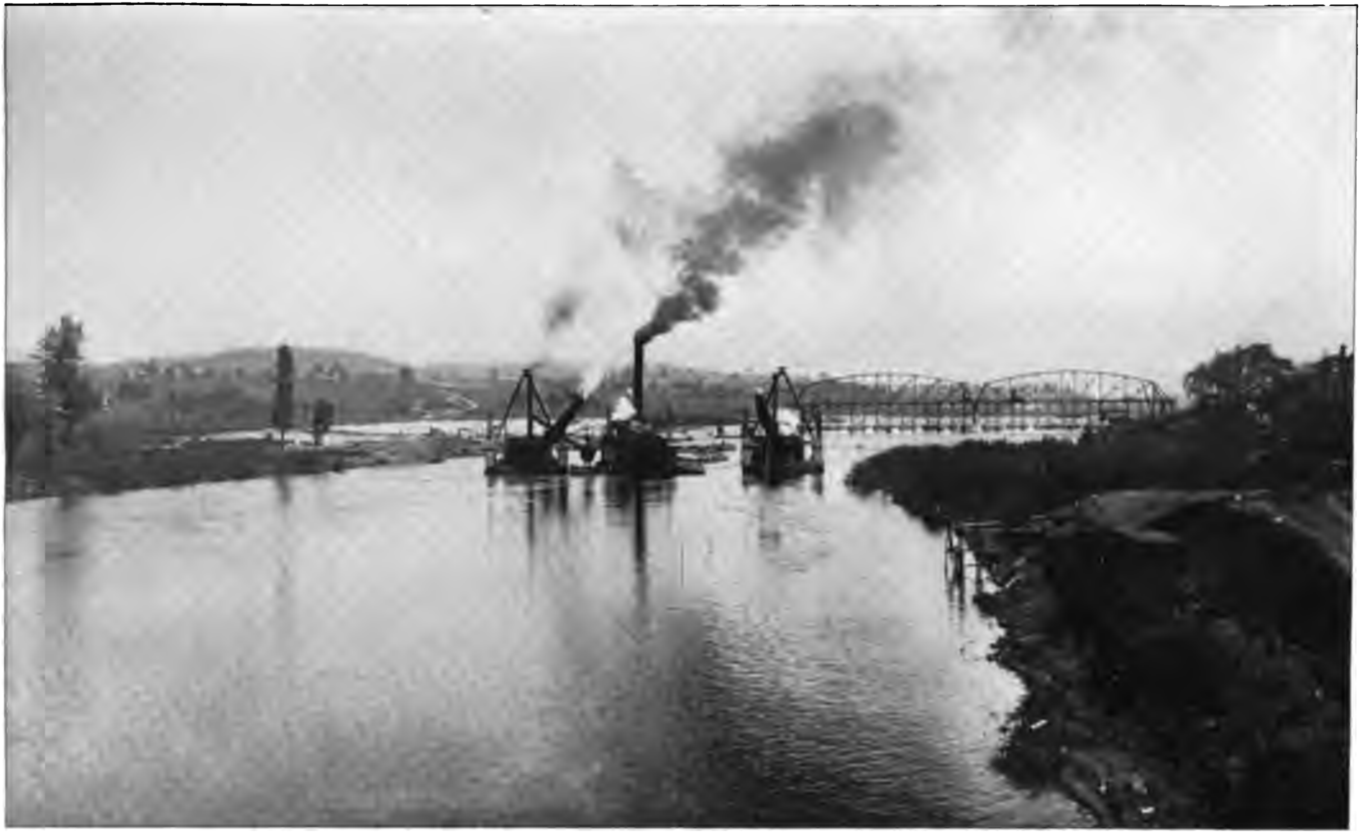
On the north side the excavated material has been spoiled above the Fort Plain dam and on the Miller and Smith parcels, and on the south side it has been placed opposite the dam, on the Allen parcel and in the back channel of the island east of Fort Plain. A large amount of rock has been spoiled along the edge of the river below Fort Plain. This was so located that it may be used at some future time for bank protection.

The stream entrance work at Otsquaga creek has been finished. Practically no new plant has been installed on this contract this year.

The following table shows the quantities of work done to October 1, 1912, and to October 1, 1913, giving also the quantities of work done during the year:

ITEMS OF WORK.		WORK DONE.		
		To October 1, 1912.	To October 1, 1913.	During fiscal year.
Excavation	cu. yds.	660,743	1,106,054	445,311
Lining	cu. yds.	32	73	41
First-class stone paving	sq. yds.	1,134	1,339	205
First-class riprap	cu. yds.	348	417	69
Second-class riprap	cu. yds.	283	371	88
Fourth-class riprap	cu. yds.	724	3,180	2,456
Cobblestone protection	cu. yds.	13,512	19,182	5,670

The total work to October 1, 1910, on this contract was $9,260, or approximately 1 per cent of the contract. On October 1, 1911, $33,480 worth of work had been completed, or 17 per cent; on October 1, 1912, $459,710, or 49 per cent, and on October 1, 1913, $762,890 worth of work was completed, or 82 per cent of



Barge Canal, Contract No. 20-B.

View showing dredges operating below dam at Fort Plain. Dipper dredges at either side deposit material on a screen of a pump boat, the fine material being pumped through a pipe line to spoil areas, while the coarse material is loaded upon scows.

the contract finished. In other words, practically 33 per cent of the contract in money value has been done during the year September 30, 1912, to September 30, 1913.

L. H. M. Whitney, Assistant Engineer, with office at St. Johnsville until May 1, 1913, and after that date with office at Fort Plain, has been in charge of this contract during the year.

The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing........................lump sum	$165	10%	55%	10	55
Excavation........................cu. yds.	*1,463,656	445,311	1,106,054	30.4	75.6
Lining........................cu. yds.	360	41	73	11.4	20.3
Wash wall........................cu. yds.	1,308	0	1,308	0	100
First-class paving........................sq. yds.	1,600	205	1,339	12.8	83.7
First-class riprap........................cu. yds.	550	69	417	12.5	75.8
Second-class riprap........................cu. yds.	600	88	371	14.7	61.8
Third-class riprap........................cu. yds.	600	0	124	0	20
Fourth-class riprap........................cu. yds.	15,600	2,456	3,180	15.7	20.4
Cobblestone protection........................cu. yds.	20,000	5,670	19,182	28.3	95.9
Extra Work Order dated Jan. 22, 1913.					
Excavation........................cu. yds.	2,227.4	2,227.4	2,227.4	100	100

* Includes 756 cu. yds. not in preliminary estimate, but estimated in April, 1913.

Contract No. 20-C.

This contract has been modified by alterations as follows:

Alterations No. 1, approved by the Canal Board January 6, 1910, changes location of certain spoil banks and center line,—improves construction.

Alteration No. 2, approved by the Canal Board September 8, 1910, changes spoil bank A at Canajoharie to avoid tow-path of old canal.

Alteration No. 3, approved by the Canal Board November 12, 1912, provides riprap below dam No. 10 at Canajoharie to prevent scour.

Surveys of land proposed to be appropriated from Sylvannus Nellis and the New York Central Railroad Co. have been made, mapped and checked, and forwarded to the Division Engineer. Reports on claims, with small location maps attached, have been prepared and forwarded to the Division Engineer for the follow-

ing claims: No. 498-A, Frederick Minister; No. 606-A, N. Y. C. & H. R. R. R. Co.; No. 495-A, Peter Lipe; No. 496-A, Daniel Shaper; No. 497-A, William Grimshaw; No. 607-A, N. Y. C. & H. R. R. R. Co.; No. 639-A, Mrs. E. C. Yates; No. 574-A, George Kelley Estate; No. 531-A, James I. Spraker; No. 785-A, E. J. Van Evra and Yates C. Van Evra; Nos. 647-A and 683-A, Florence M. Keck; No. 786-A, Elizabeth Russ; No. 788-A, Marcus Bennett; No. 787-A, Chas. L. Kelley; No. 932, Wm. B. Diefendorf and Jay Van Evra.

Since October 1, 1912, the river and stream entrances for the entire contract have been cross-sectioned twice, once at the end of last season and once before the work of cleaning or preparing the contract for acceptance began.

On October 1, 1913, there were approximately 85,660 cu. yds. of excavation within the grade lines, 37,925 cu. yds. of which was material in the original contract, the difference, or 47,735 cu. yds., being material washed down from contract No. 20-B, from creeks and from the river banks.

On October 1, 1913, the stream entrances on this contract were practically completed except possibly one or two small ones.

The following table shows the quantities of work done on October 1, 1912, on October 1, 1913, and during the intervening year:

ITEMS OF WORK.		WORK DONE.		
		To October 1, 1912.	To October 1, 1913.	During fiscal year.
Excavation	cu. yds.	1,144,448	1,180,791	36,343
Lining	cu. yds.	122	277	155
First-class stone paving	sq. yds.	1,072	1,959	887
First-class riprap	cu. yds.	337	548	211
Second-class riprap	cu. yds.	329	1,480	1,151
Third-class riprap	cu. yds.	85	135	50
Fourth-class riprap	cu. yds.	1,194	1,495	301

To October 1, 1910, $7,640 worth of work, or 1.3 per cent of this contract was finished; to October 1, 1911, $324,260 worth of work, or 55 per cent; to October 1, 1912, $594,190 worth of work, or 90 per cent; to October 1, 1913, $622,200 worth of work has been finished, which includes about 92 per cent of the original contract and $81,805 worth of work not in the preliminary estimate for this contract.

A. G. Austin, Assistant Engineer, with an office at Canajoharie, has been in charge of this contract during the year.

The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Perliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing........................lump sum	$180	10%	100%	10	100
Excavation........................cu. yds.	*1,263,302	36,343	1,180,791	2.9	93.5
Lining........................cu. yds.	480	155	277	32.3	57.7
First-class paving..................sq. yds.	2,500	887	1,959	35.5	78.4
First-class riprap..................cu. yds.	700	211	548	30.1	78.3
Second-class riprap..................cu. yds.	6,210	1,151	1,480	18.5	23.8
Third-class riprap..................cu. yds.	400	50	135	12.5	33.7
Fourth-class riprap..................cu. yds.	2,600	301	1,495	11.6	57.5
Extra Work Order dated Jan. 24, 1912.					
Fourth-class riprap..................cu. yds.	1,276.24	0	1,276.24	0	100

* Includes 114,685 cu. yds. not in preliminary estimate, but in September, 1911, estimate, also 11,692 cu. yds in July, 1912, estimate and 34,025 cu. yds. in July, 1913, estimate.

Contract No. 20-D, *Section No.* 3.

This contract has been modified by alterations as follows:

Alteration No. 2, approved by the Canal Board November 22, 1910, changes spoil banks to avoid erosion.

Alteration No. 3, approved by the Canal Board May 18, 1911, straightens channel below lock No. 11 to improve alignment.

Alteration No. 4, approved by the Canal Board November 12, 1912, provides riprap below dams Nos. 6 and 9 and lock No. 10 to prevent scour.

Alteration No. 5, approved by the Canal Board June 11, 1913, changes alignment Sta. 2319 to Sta. 2419,— improvement at decreased cost.

During the year, surveys of the following parcels have been made, mapped and checked and sent to the Division Engineer: Martin Estate; New York Central & Hudson River Railroad Co.; Jacob Klock; Alex. Yates; Charles Young; Peter Vrooman; James Burr; Alfred DeGraff; Susan H. Shutts; Aaron Pepper Estate, 2 parcels; Catherine Robb; Alfred DeGraff, 2 parcels and a release map; N. Y. C. & H. R. R. R. Co., release map.

On this contract, this section, original cross-sections were taken from Sta. 2840 to Sta. 2480, Sta. 2436 to Sta. 2428, Sta. 2364 to Sta. 2316 and from Sta. 2268 to Sta. 2298, also of Van Wie's, Auries, Danoscara and Cayadutta creeks.

Cross-sections to ascertain the scour of the spring floods were taken over the dredged channel between Stas. 2949 and 2738. About 95,000 cu. yds. were washed in during the winter and spring, above grade.

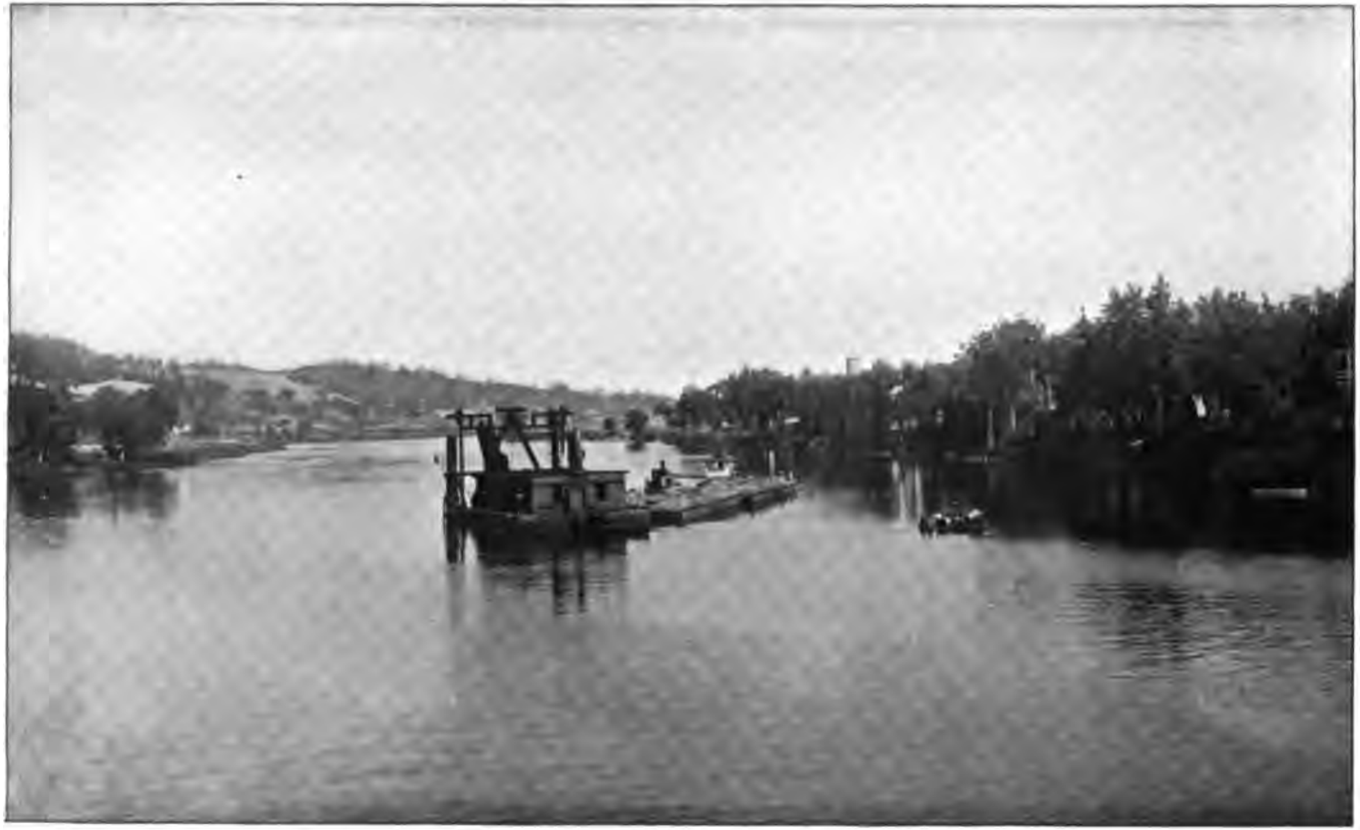
During the year the hydraulic dredge *Mohawk* did the prism excavation between Stas. 2846 and 2805 + 35, also from Sta. 2801 to Sta. 2732, Sta. 2733 to Sta. 2714 + 70, including Cayadutta creek outlet, Sta. 2652 to Sta. 2601, Sta. 2548 to Sta. 2532, and between Stas. 2522 and 2509, also the outlets to Danoscara and Auries creeks, and over-depth excavation between Stas. 2745 and 2732 and between Stas. 2646 and 2638 for a spoil area for the dipper dredge.

The dipper dredge No. 1 did the prism excavation between Stas. 2937 + 60 and 2929, also, under alteration No. 4, the excavation for riprap below dam No. 9 between Stas. 2947 + 52 and 2946 + 02. This dredge has also done the prism excavation between the Fonda bridge, Sta. 2702, and Sta. 2666, from Sta. 2532 to Sta. 2522 and a part of the stream entrances at Auries and Danoscara creeks.

The prism from the Fonda–Fultonville bridge to Schoharie creek outlet is nearly completed.

During the year the stream entrance work at Danoscara and Van Wie's creeks has been practically completed and the work at Auries creek has been started.

During the year a hull for a derrick boat was built at Canajoharie, launched, partly equipped and moved to Fonda, where it was finished. This hull is 60 ft. long by 30 ft. beam and has a depth of 6 ft. 6 inches, containing 30,500 ft. B. M. of lumber. The hull is equipped with a 40-h. p. Lidgerwood boiler and a double-cylinder, 3-drum, Lidgerwood engine, 9 in. x 10 in.; also stiff-leg derrick with boom 12 in. x 12 in. x 60 ft. and mast 12 in. x 12 in. x 22 ft. This boat is used to lay riprap and also to excavate under bridges where the dredges cannot work. For excavating under the Fultonville–Fonda bridge, this derrick



Barge Canal, Contract No. 20-D.
View showing dipper dredge operating in the vicinity of Fonda, and scows upon which material is placed and towed to the spoil areas.

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boat was rigged with a smaller derrick with a mast only 15 ft. long.

The following additional plant has been put in commission during the past year:

Dipper dredge No. 4, the hull of which is 102 ft. long, 38 ft. wide and 8 ft. 7 inches deep, equipped with a 4-cu. yd. dipper with manganese steel front and a 45-ft. boom built up of steel. The dipper handle is 42 ft. long by 22½ inches square. The main hoisting engine has 16-in. cylinder and 18-in. stroke. The forward spuds are 36 in. x 36 in. square x 38 ft. long, built up of wood and operated by 9 in. x 9 in. engines. The rear spud is 20 in. x 20 in. x 38 ft. The boom is mounted on a swinging circle 18 ft. in diameter and operated by two 9 x 9-in. engines. The boom is supported by a steel "A" frame. The boiler is a Scotch marine type with 1,500 sq. ft. of heating surface. The lighting system is worked with a 5-k. w. generator. The cables used are as follows: Main hoist, 1⅜-in. diameter; swinging circle, 1¼-in. diameter; forward spuds, 1⅜-in. diameter; and aft spud 1-in. diameter. The backing chain has 1¼-in. links.

The tug-boat *Hudson,* length 43 ft., beam 13 ft., draft 6 ft. 8 in. under normal conditions. The engine is 13½-in. x 14-in. stroke and the boiler of marine type.

Dump scow, capacity 100 cu. yds., length 95 ft., beam 17 ft. and depth 7 ft. 6 inches.

Two dump scows, capacity of each 175 cu. yds., length 105 ft., beam 30 ft. and depth 6 ft. 6 inches.

Motor boat, length 25 ft., beam 5 ft. and 16-h. p. motor.

Tug-boat *Arrow,* length about 40 ft., beam 12 ft., draft 6 ft., equipped with 10 x 10-in. engine.

The new dipper dredge was built in Amsterdam and put in operation above lock No. 11, July 23, 1913. This dredge has worked since between Stas. 2318 + 80 and 2346 + 75, about 51,600 cu. yds. of excavated material being spoiled between Stas. 2300 and 2335 back of Pepper island, and between Stas. 2250 and 2270, back of Robb island.

The following table shows the quantities of work done on this contract during the year:

ITEMS OF WORK.		WORK DONE.		
		To October 1, 1912.	To October 1, 1913.	During fiscal year.
Excavation	cu. yds.	484,583	1,382,909	898,326
Lining	cu. yds.	18	73	55
First-class stone paving	sq. yds.	114	437	323
First-class riprap	cu. yds.	67	178	111
Second-class riprap	cu. yds.	61	176	115
Fourth-class riprap	cu. yds.	123	384	261

M. E. James, Assistant Engineer, with office at Fultonville, has been in charge of contract No. 20-D, section No. 3 during the past year.

Contract No. 20-D, *Section No.* 2.

During the year, surveys of the following parcels have been made, mapped and checked and sent to the Division Engineer: Mrs. Isaac Swart; New York Central and Hudson River R. R. Co.; David C. DeGraff, right to flood map; Mrs. John Buys; John G. DeGraff, right to flood map; Mrs. Maggie Bradt; S. Vedder Bradt; S. M. Putman; A. Francis Bradt, and Nicolo Bassano.

During the year the hydraulic dredge *Amsterdam* and the dipper dredge worked between Sta. 1665 and dam No. 6. The prism excavation has been nearly completed during the year between Stas. 1991 + 66 and 1862, also Sta. 1840 to Sta. 1750 and Sta. 1665 to Sta. 1670.

Under an extra work order, repairs were made to lock No. 9 and dam No. 5, 161 piles, 12 in. x 12 in. and 43 ft. long, being driven as sheet-piling across the upper end of the lock and along the river wall to the upper side of the dam and then about 20 ft. at right angles to the river wall toward the center of the river, and 374 cu. yds. of concrete being placed over the top of the piles and back to the old concrete of the lock and dam. About 200 ft. of crib coffer-dam was built. These piles were driven with a No. 1 steam hammer. 3 pieces of 3-in. x 4-in. lagging were spiked on two faces of the timber to make it tongued and grooved. No little trouble was experienced in driving these piles on account of the friction and on account of riprap stone, old coffer-dam material, etc., which was in many cases below the surface and had to be hooked out with grapples, etc.

The following shows the amount of work done on this section during the past year:

ITEMS OF WORK.	WORK DONE.		
	To October 1, 1912.	To October 1, 1913.	During fiscal year.
Excavation...cu. yds.	54,285	697,600	643,315

T. S. Bailey, Assistant Engineer, with an office at lock No. 9 and lock No. 10, has been in charge of work on this section during the year.

For the whole of contract No. 20-D, on October 1, 1911, $60,120 worth of work, or 2 per cent of the contract had been done; on October 1, 1912, $276,880 worth of work, or 10 per cent of the contract had been finished; on October 1, 1913, $1,087,680 worth of work, or 40.6 per cent of the contract is finished, thus showing that 30.6 per cent of this contract was completed during the past year.

The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing..........................lump sum	$720	0	8%	0	8
Excavation..........................cu. yds.	5,118,800	1,584,194	2,123,062	30.9	41.5
Lining..........................cu. yds.	650	55	73	8.4	11.2
Second-class concrete................cu. yds.	400	0	61	0	15
First-class paving..................sq. yds.	3,600	323	437	8 9	12.1
First-class riprap..................cu. yds.	2,000	111	178	5.5	8.9
Second-class riprap..................cu. yds.	10,540	115	176	1.1	1.7
Third-class riprap..................cu. yds.	1,200	0	0	0	0
Fourth-class riprap..................cu. yds.	6,000	261	384	4.3	6.4
Extra Work Order dated Nov. 18, 1912.					
Labor and material, etc....................	*........	$32,827.41	$32,827.41	....	....

* This extra work order has not been finished to date.

Contract No. 86.

On this contract, during the year, the old south pier was removed, the old spans removed and the new steel erected, the block pavement laid and the concrete walks laid.

With the exception of an extra work order for some railing along the trusses and the removal of a few yards of excavation from the old south pier, this contract is completed. The final account is nearly prepared.

The following shows the amount of work done during the year on this contract:

ITEMS OF WORK.		WORK DONE.	
	To October 1, 1912.	To October 1, 1913.	During fiscal year.
Excavation .... cu. yds.	738	2,257	1,519
Piles, 12 ft. long, or under .... lin. ft.	0	870	870
Second-class concrete .... cu. yds.	455	996	541
Reinforced concrete .... cu. yds.	0	46	46
Fourth-class riprap .... cu. yds.	0	102	102
Structural steel .... lbs.	27	396,912	396,885
Metal reinforcement .... lbs.	1,161	9,834	8,673
Pavement .... sq. yds.	0	468	468
Sidewalk railing .... lin. ft.	0	452	452
Iron castings .... lbs.	880	2,080	1,200
Test piles .... No.	2	3	1
Creosoted lumber .... ft. B. M.	0	20,900	20,900
Coffer-dams, etc .... per cent.	25	100	75
Maintaining traffic .... per cent.	0	100	100
Amount payable for bridge superstructure .... per cent.	0	100	100

To October 1, 1912, $4,940 worth of work, or 11 per cent of this contract was done; on October 1, 1913, this contract is practically finished.

C. R. DeGraff, Assistant Engineer, with office at Canajoharie, has had charge of this contract from the beginning until May 1, 1913. Since that time, W. H. H. Klinkhart, Masonry Inspector, has been in charge.

The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation........................cu. yds.	5,000	1,519	2,257	30.4	45.1
Sheeting and bracing................ft. B. M.	12,039	0	12,039	100	100
Piles, 12 ft., or under..................lin. ft.	2,200	870	870	39.5	39.5
Second-class concrete................cu. yds.	1,150	541	996	47	86.6
Reinforced concrete...................cu. yds.	50	46	46	92	92
Fourth-class riprap...................cu. yds.	*102	102	102	100	100
Structural steel...........................lbs.	414,000	396,885	396,912	95.8	95.9
Metal reinforcement.....................lbs.	10,600	8,673	9,834	81.8	92.8
Wood block pavement...............sq. yds.	472	468	468	99.1	99.1
Sidewalk railing.......................lin. ft.	452	452	452	100	100
Iron castings..............................lbs.	2,300	1,200	2,080	52.2	90.4
Test piles..................................No.	4	1	3	25	75
Creosoted lumber.................ft. B. M.	22,000	20,900	20,900	95	95
Coffer-dams, pumping, bailing and draining, lump sum	$2,100	75%	100%	75	100
Maintaining highway traffic........lump sum	$1,800	100%	100%	100	100
Deduct for bridge superstructure, etc.lump sum	$211	100%	100%	100	100

* Includes excess of 12 cu. yds. of fourth-class riprap.

ERIE CANAL, RESIDENCY No. 3.

Resident Engineer Ernest D. Hendricks reports:

The limits of this residency are old lock No. 27, near Cranesville, on the east, and lock No. 34, near Mindenville, on the west. The contract work included in this residency has consisted of contract No. 17 and parts of contracts Nos. 14 and 36. At present the work on this residency consists of the operation of movable dams Nos. 5 to 11, inclusive, and the care and operation of the adjacent locks.

Contract No. 17.

This contract is completed. The work consisted of the construction of dam No. 7, lock No. 11, at Amsterdam, and dam No. 8, lock No. 12, at Tribes Hill. The contract work was performed by Alexander Murdoch. All work was completed previous to the past year.

Contract No. 14, *Section No.* 3.

The work on this contract includes the construction of dam No. 9 and lock No. 13 at Yosts, dam No. 10 and lock No. 14

at Canajoharie, dam No. 11 and lock No. 15 at Fort Plain, and the retaining dam at Mindenville.

At the beginning of the past year all contract work had been completed. Portions of the coffer-dams, however, remained in the river and these have since been removed. The final estimate for this contract was completed during the past year.

A list of alterations on this contract is given in the report of Residency No. 2.

The quantities for the preliminary and final estimates follow:

ITEMS OF WORK.		Preliminary estimate, as affected by alterations.	Final estimate.
Clearing	lump sum	$50	50%
All excavation	cu. yds.	423,165	302,774
Sheeting and bracing	ft. B. M.	83,412	73,077
Forming embankment, first-class	cu. yds.	65,877	51,541
Sawed lumber, yellow pine or Douglas fir	ft. B. M.	115,890	31,633
Sawed lumber, hemlock	ft. B. M.	64,962	49,094
White oak in miter-sills and gates	ft. B. M.	35,100	19,510
Sawed lumber, white oak	ft. B. M.	7,000	6,136
Creosoted yellow pine or Douglas fir	ft. B. M.	15,700	19,444
Stone filling in cribs	cu. yds.	1,400	1,181
Foundation piles, 10 ft. long	No.	70	79
Foundation piles, 12 ft. long	No.	118	85
Foundation piles, 14 ft. long	No.	1,500	38
Foundation piles, 16 ft. long	No.	2,562	1,665
Foundation piles, 20 ft. long	No.	0	338
Wooden sheet-piling	ft. B. M.	115,270	85,824
Second-class concrete	cu. yds.	75,199	64,909
Third-class concrete	cu. yds.	1,280	794
Reinforced concrete	cu. yds.	0	1.44
Second-class stone paving	sq. yds.	3,577	3,380
Third-class stone paving	sq. yds.	460	372
Ballast	cu. yds.	2,263	1,753
First-class riprap	cu. yds.	2,847	2,583
Second-class riprap	cu. yds.	7,460	5,955
Third-class riprap	cu. yds.	942	940
Fourth-class riprap	cu. yds.	8,607	7,585
Structural steel	lbs.	2,526,966	2,572,588
Metal in uprights for dams	lbs.	580,000	537,141
Metal in gates for dams	lbs.	830,000	780,723
Metal in lock-gates	lbs.	566,400	521,811
Metal in needle-dams	lbs.	246,000	175,626
Metal in lock-valves	lbs.	69,600	67,912
Metal reinforcement	lbs.	198,769	176,666
Iron castings, plain	lbs.	34,900	31,897
Iron castings, machined	lbs.	22,200	19,786
Cast iron shoes for uprights	lbs.	86,000	82,758
Wrought iron chains	lbs.	148,000	142,654
Wrought iron pipe railing	lin. ft.	3,500	3,455

Contract No. 36.

This contract was completed in 1912.

Operation of Movable Dams.

The specifications for the dredging contracts call for the lowering of the dams in the Mohawk river to facilitate dredging operations. Dams Nos. 5 to 11, inclusive, have been operated during the year for this purpose. In addition to this they have been used to minimize flood conditions as much as possible.

A dam-tender and three assistants are employed on each of the dams while it is in operation. These men are required to maintain the level above the dam at the required depth, read the gages above the dam every four hours and keep the dam clear of the debris and driftwood, which lodges against the chains and uprights.

All dams were raised between December 15 and 23, at the close of the 1912 season.

For the season of 1913 the dams were placed in operation as required by the contractors from March to June. The damage caused by the flood of March 25–28 at dam No. 9 at Yosts and dam No. 8 at Tribe's Hill has been repaired and all dams are in operation.

A. O. Hollenbeck is in charge of dams Nos. 5-8, inclusive, reporting to this office. Credit should be given to the dam-tenders and their assistants for their intelligent and faithful performance of their duties.

ERIE CANAL, RESIDENCY NO. 4.

Resident Engineer George I. Oakley reports:

Residency No. 4 of the Erie canal extends from a point 2,400 feet east of lock No. 34 of the present canal at Mindenville, Montgomery county, to the division line between contracts Nos. 30 and 29, near Sterling creek, and four miles east of the easterly boundary line of the city of Utica. The length of the Barge canal within the limits of Residency No. 4 is 23.8 miles.

The construction work on this residency is divided into the following main contracts:

Contract No. 18. Land line from one-half mile east of Mindenville to Indian Castle. Length, 3.63 miles. Kelley Bros. Contracting Co., Syracuse, N. Y., contractors. Final estimate of contract as revised, $476,978.85.

Contract No. 20-A. Land line and dredging from Indian Castle to Little Falls. Length, 4.5 miles. Houston Barnard, Rochester, N. Y., contractor. Final estimate of contract as revised, $320,690.94.

Contract No. 31. Land line through Little Falls. Length, 1.01 miles. Casey & Murray, Rochester, N. Y., contractors. Final estimate of contract, $751,341.76.

Contract No. 30. Land line and dredging river from Little Falls to Sterling creek. Length, 14.62 miles. Acme Engineering & Contracting Co., Herkimer, N. Y., contractors. Original contract price, $2,591,666.50; as revised by alterations Nos. 1 to 11, inclusive, $2,681,761.12.

Contract No. 13. Superstructures for two bridges on contract No. 18 are included in this contract. Penn Bridge Co. Beaver Falls, Pa., contractors. Final estimate, Residency No. 4 portion, $9,932.18.

Contract No. 87. For constructing a bridge over the improved Erie canal at Sta. 4078, one-quarter mile east of Rocky Rift dam on contract No. 20-A. The P. B. McCaghey Co., Little Falls, N. Y., contractors. Contract price, $11.202.50.

Contract No. 92. For power plants, electric equipment and machinery for operating and lighting locks Nos. 16, 17, and 18, on Residency No. 4. Contract let to McArthur Bros. Co. & Lord Electric Co.

Contract No. 107. For constructing a lift-bridge over the improved Erie canal at Little Falls, N. Y. Jackson L. Richmond, Brockport, N. Y., contractor. Contract price, $127,707.30.

The contract has not been awarded for the completion of the unfinished portions of contracts Nos. 18 and 20-A and the completion of the work within the limits of contract No. 31, necessary to change from the present canal to the Barge canal. These plans are nearly completed.

In order to complete the Barge canal additional work will be required on contract No. 30, consisting in the construction of necessary connections between the existing canal and the Barge canal at various points between Jacksonburg and Mohawk.

The following statements show the progress made on construction work during the past year on the contracts actively in force on the residency:

Contract No. 20–A.

This contract begins at the western end of contract No. 18, at Indian Castle, and extends to the eastern end of contract No. 31, at Little Falls. The work includes 0.7 mile of land line at the eastern end and 3.8 miles of dredging in the Mohawk river between Rocky Rift dam and Little Falls. The contract was let on August 20, 1909, to Houston Barnard, of Rochester, N. Y.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board June 25, 1910, increases height of spoil banks, north side, Sta. 4059 to Sta. 4079, at contractor's request — no increase.

Alteration No. 2, approved by the Canal Board August 30, 1911, increased height of spoil banks, south side, Castle creek to Sta. 4100.

Alteration No. 3, approved by the Canal Board July 11, 1912, permits use of cobblestone for wash wall to expedite work, no increase; raises dike along east bank of Castle creek for flood protection.

Alteration No. 4, approved by the Canal Board September 9, 1913, eliminates work unfinished to avoid interference with navigation.

During the first year of this contract 8.5 per cent was done, during the second year 15.9 per cent, during the third year 36.6 per cent and during the fall of last year 4.3 per cent was done, making a total of 65.3 per cent of the original contract completed on January 1, 1913.

During the fall of 1912 the 12-inch hydraulic dredge *Indian Castle* continued the prism excavation in the river and land line. A traveling derrick equipped with an orange-peel bucket excavated in the vicinity of Castle creek. 200 linear feet of riprap protection was placed on the north embankment opposite Castle creek and about 350 cu. yds. of wash wall on the prism slopes.

Between January 1, and June 11, 1913, no work was done on this contract. Owing to difficulties in finishing the work at points where it conflicted with the operation of the present Erie canal, the contract was cancelled by the Canal Board on June 11, 1913.

The engineering work on this contract has been in charge of E. E. Kendall, Assistant Engineer.

The following summary shows the amount of work put under contract and the amount done up to June 11, 1913, including alterations in force and extra work orders:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing . . . . lump sum	0	0	0	0	Contract completed.
Grubbing . . . . cu. yds.	294	11	294	3.7	
Excavation . . . . cu. yds.	384,756	12,647	384,756	3.3	
Sheeting and bracing . . . . ft. B. M.	0	0	0	0	
Round timber bracing . . . . lin. ft.	0	0	0	0	
Forming embankment . . . . cu. yds.	8,860	3,636	8,860	41	
Lining . . . . cu. yds.	0	0	0	0	
Wash wall . . . . cu. yds.	4,097	137	4,097	3.3	
First-class riprap . . . . cu. yds.	0	0	0	0	
Second-class riprap . . . . cu. yds.	141	141	141	100	
Third-class riprap . . . . cu. yds.	224	224	224	100	
Fourth-class riprap . . . . cu. yds.	0	0	0	0	
Extra Work Orders.					
Moving bridge over R. R. feeder, Sta. 4079, lump sum	. . . .	. . . .	$200	0	
Maintaining highway traffic over R. R. feeder, Sta. 4079 . . . . lump sum	. . . .	$600	$600	100	

Contract No. 87.

This contract is for the construction of a farm bridge over the improved Erie canal at Indian Castle, one-quarter mile east of Rocky Rift dam. The work includes a steel bridge with abutments and approaches.

The contract was let on February 17, 1913, to the P. B. McCaghey Co. of Little Falls, N. Y. Delivery of plant was made at site on March 5, 1913, and actual work started on April 14. The abutments and approaches have been completed and the steel work assembled. Work completed to September 30, 1913, is 63.4 per cent.

The engineering work on this contract is in charge of E. E. Kendall, Assistant Engineer.

The following summary shows the amount of work put under contract and the amount of work done to September 30, 1913:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation . . . . . cu. yds.	3,900	3,361	3,361	86.2	86.2
Forming embankment . . . . . cu. yds.	1,800	1,906	1,906	105.9	105.9
Sawed lumber, yellow pine . . . . . ft. B. M.	5,500	0	0	0	0
Second-class concrete . . . . . cu. yds.	525	561	561	106.9	106.9
Structural steel . . . . . lbs.	75,000	0	0	0	0
Wooden fence . . . . . lin. ft.	275	0	0	0	0
Coffer-dams, pumping, bailing and draining. lump sum	$480	$480	$480	100	100

Contract No. 107.

This contract provides for the construction of a lift-bridge and a fixed bridge over the Erie canal at Little Falls. The contract was let on February 19, 1913, to Skene & Richmond of Brockport, N. Y. On August 11, 1913, this contract was assigned to Jackson L. Richmond.

A small amount of work for maintenance of highway traffic was done during April. The actual work of construction was not started until August 9. The work done has been the construction of four concrete piers for the emergency bridge and a small amount of excavation. The present steel bridge over the Erie canal has been moved westerly about 200 feet and timber trestles erected at the ends for maintenance of highway traffic. Work completed to September 30, 1913, is 4.1 per cent.

The engineering work on this contract is in charge of E. E. Kendall, Assistant Engineer.

The following summary shows the amount of work put under contract and the amount of work done to September 30, 1913:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation . . . . . cu. yds.	18,500	1,565	1,565	8.5	8.5
Forming embankment . . . . . cu. yds.	66	0	0	0	0
Lining . . . . . cu. yds.	375	0	0	0	0
Lowering lining on tow-path . . . . . cu. yds.	146	0	0	0	0
Second-class concrete . . . . . cu. yds.	2,420	64	64	2.6	2.6
First-class reinforced concrete . . . . . cu. yds.	53	0	0	0	0
Second-class reinforced concrete . . . . . cu. yds.	1,150	0	0	0	0
Structural steel . . . . . lbs.	800,000	270	270	0.03	0.03

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Metal reinforcement....................lbs.	72,200	0	0	0	0
Machinery..............................lbs.	65,100	0	0	0	0
Cast iron pipe and specials...............lbs.	6,300	0	0	0	0
Metal ducts.............................lbs.	2,400	0	0	0	0
Sawed lumber, yellow pine..........ft. B. M.	45,000	0	0	0	0
Sheeting and bracing................ft. B. M.	6,000	0	0	0	0
Lattice railing.........................lin. ft.	395	0	0	0	0
Wrought iron pipe railing.............lin. ft.	170	0	0	0	0
Wooden fence.........................lin. ft.	242	0	0	0	0
6-in. vitrified pipe and specials.........lin. ft.	273	0	0	0	0
Drilling holes in rock and existing masonry, lin. ft.	200	0	0	0	0
Brick pavement.................... sq. yds.	283	0	0	0	0
Cobblestone paving..................sq. yds.	37	0	0	0	0
Portland cement sidewalks .... sq. ft.	1,080	0	0	0	0
Relaying flagstones...................sq. ft.	198	0	0	0	0
Electric equipment................lump sum	$3,000	0	0	0	0
Plumbing........................lump sum	$550	0	0	0	0
Doors, windows, woodwork, hardware, roofing, painting......................lump sum	$500	0	0	0	0
Maintenance accessories...........lump sum	$100	0	0	0	0
Catch basin......................lump sum	$100	0	0	0	0
Maintenance of navigation.........lump sum	$800	0	0	0	0
Maintenance of highway traffic.... lump sum	$1,400	$1,120	$1,120	80	80
Removing building......................No.	5	1	1	20	20
Deduct bridge superstructures removed, lump sum	$400	0	0	0	0

Contract No. 31.

This contract provides for the construction of lock No. 17, guard-gates, bridge, retaining walls and one mile of land line through the city of Little Falls and for the construction of a movable crest for the Rocky Rift dam and the superstructure of the Indian Castle guard-gates. The contract was let on September 2, 1908, to Casey & Murray, of Rochester, N. Y.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board February 24, 1909, changes specifications for concrete to secure better mixture.

Alteration No. 2, approved by the Canal Board September 22, 1909, changes power plant to conform to standard; changes ports in north culvert of lock to provide better operation.

Alteration No. 3, approved by the Canal Board February 23, 1910, substitutes concrete for dry wall to prevent leakage; changes location of walls to avoid encroaching on adjacent property.

Alteration No. 4, approved by the Canal Board December 29, 1910, changes spoil bank at Adirondack Woolen Company's mill to provide roadway.

Alteration No. 5, approved by the Canal Board March 22, 1911, modifies wall on north side, Sta. 4324 to Sta. 4326, to get better structure.

Alteration No. 6, approved by the Canal Board December 27, 1911, changes wall at Hanson avenue — better construction; improves highway, Sta. 4307.

Alteration No. 7, approved by the Canal Board February 28, 1912, eliminates new wall from lock No. 38 to German street to preserve present tow-path.

The work on this contract after September 30, 1912, was the placing, under an extra work order, of a line of pipe railing on the dry wall and a wooden fence along the roadway adjacent to the Adirondack Woolen Company's mills. Also a general clean up of contract site was made, including the removal of the remaining plant. A final estimate of $751,341.76 was prepared and accepted by the Canal Board, February 27, 1913.

The engineering work on this contract has been in charge of E. E. Kendall, Assistant Engineer.

The following summary shows the amount of work put under contract and the amount of the final estimate, including alterations and extra work orders:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations to date.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing..........lump sum	$100	0	$100	0	Contract completed.
Excavation..........cu. yds.	243,308	3,453	222,969	1.4	
Removal of dam masonry..........cu. yds.	250	5	134	2	
Round bracing..........lin. ft.	1,000	0	0	0	
Sheeting and bracing..........ft. B. M.	30,000	0	0	0	
Channeling..........sq. ft.	43,000	0	0	0	
Embankment..........cu. yds.	15,800	1,760	10,821	11.1	
Lining..........cu. yds.	3,320	292	4,110	8.8	
Puddle..........cu. yds.	740	78	591	10.5	
Sawed lumber..........ft. B. M.	76,000	398	66,898	0.5	
White oak timber in miter-sills and gates ft. B. M.	4,500	—423	2,954	—9.4	
Sawed lumber in needles..........ft. B. M.	7,000	1,081	7,816	15.4	
Round timber..........lin. ft.	5,300	—9	2,744	—0.2	
Second-class concrete..........cu. yds.	58,830	113.6	53,683.6	0.2	
Reinforced concrete..........cu. yds.	387	0.3	283.3	0.1	
First-class masonry coping..........cu. yds.	3	0	2.31	0	
Dry retaining wall, including coping...cu. yds.	5,910	50	5,520	0.8	
Third-class stone paving..........sq. yds.	168	43	183	25.6	
Cobblestone paving..........sq. yds.	180	6	115	3.3	
First-class riprap..........cu. yds.	230	3	120	1.3	
Fourth-class riprap..........cu. yds.	12,400	384	8,387	3.1	
Structural steel..........lbs.	155,485	2,268	160,334	1.5	
Metal reinforcement..........lbs.	101,290	2,434	109,218	2.4	
Iron castings, plain..........lbs.	26,800	75	23,247	0.3	
Iron castings, machined..........lbs.	13,000	0	12,648	0	

— Decrease.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations to date.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Metal in upper lock-gates............lbs.	138,000	88	137,530	0.06	Contract completed.
Metal in lower lock-gates............lbs.	430,000	—232	422,879	—0.05	
Metal in buffer-beams............lbs.	80,000	0	80,012	0	
Metal in lock-valves............lbs.	60,000	—253	55,915	—0.4	
Metal in guard-gates............lbs.	680,000	4,153	665,514	0.6	
Wooden fence............lin. ft.	1,500	8	959	0.5	
Wrought iron pipe railing............lin. ft.	1,080	—1	995	—0.09	
Lattice railing............lin. ft.	184	2	183	1.1	
Filling seams............lin. ft.	2,500	0	0	0	
Repointing old masonry............lin. ft.	3,000	0	1,395	0	
Storehouses............No.	2	0	2	0	
Coffer-dams, pumping, bailing, etc..lump sum	$12,000	$840	$12,000	7	
Drilling bolt holes in rock............lin. ft.	650	0	49	0	
Raising bridge superstructure.......lump sum	$1,800	0	$1,800	0	
Maintaining highway traffic........lump sum	$1,000	0	$1,000	0	
Maintaining navigation............lump sum	$1,000	0	$1,000	0	
Deduct for buildings removed......lump sum	$3,500	0	$3,500	0	
Deduct for bridge superstructures removed, lump sum	$50	0	$50	0	
Extra Work Orders.					
Bracing timber tow-path..........lump sum	....	....	$450	....	
Drilling and furnishing material for electric wire ducts..........lump sum	....	....	$841.80	....	
Removal of Reddy building........lump sum	....	....	$175	....	
Concrete foundation for dry wall......cu. yds.	....	....	$34.10	....	
Placing wooden and iron fence at Adirondack Woolen Co..........lump sum	....	$223.72	$223.72	100	
Changing type of pipe railing fastening on dry walls..........lump sum	....	$336.90	$336.90	100	

— Decrease.

Contract No. 30.

This contract extends westward from contract No. 31 and includes 3.1 miles of river line to Jacksonburg, 4.2 miles of land line to Herkimer, 4.4 miles of river line to Frankfort and 3 miles of land line to a point about one-half mile east of Sterling creek. The contract includes lock No. 18 at Jacksonburg, guard-gates and a movable dam at Herkimer, a retaining dam at Frankfort, five bridges, retaining walls and incidental work. The contract was let on July 16, 1909, to the Acme Engineering and Contracting Co. of Herkimer, N. Y. Work was begun in October, 1909.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board September 8, 1910, changes spoil banks between Little Falls and Jacksonburg to allow filling of railroad property.

Alteration No. 2, approved by the Canal Board September 29, 1910, provides additional conduits for electric wires at lock No. 18.

Alteration No. 3, approved by the Canal Board November 22, 1910, reinforces north bank with additional material and wooden sheeting, Sta. 4685 to Sta. 4700, and provides cut-off walls for culvert, Sta. 4572 + 10, on account of soft material.

Alteration No. 4, approved by the Canal Board December 29, 1910, flattens side slopes on north side, Sta. 4617 to Sta. 4637, and reduces amount of wash wall on account of flattened slopes.

Alteration No. 5, approved by the Canal Board March 22, 1911, eliminates wash wall west of Frankfort on account of flattened slopes.

Alteration No. 6, approved by the Canal Board November 16, 1911, changes retaining wall on south side, Sta. 4671 to Sta. 4686, and at south approach of Washington street bridge on account of soft material.

Alteration No. 7, approved by the Canal Board January 31, 1912, provides wooden sheet-piling under embankment west of lock No. 18 to prevent seepage.

Alteration No. 8, approved by the Canal Board May 22, 1912, changes plans of bridges at Ilion, Frankfort and East Schuyler to provide better foundations and eliminate grade crossing at Frankfort, etc.

Alteration No. 9, approved by the Canal Board August 27, 1912, changes construction at south side of Washington street on account of soft material, etc.; changes location of Frankfort dam to accommodate terminal plans; permits use of concrete for paving at Fulmer creek; changes alignment, Sta. 4839 to Sta. 4852, to avoid damage to railroads; changes alignment just west of Little Falls on account of railroad improvements.

Alteration No. 10, approved by the Canal Board January 29, 1913, increases embankment above lock No. 18 to insure stability.

Alteration No. 11, approved by the Canal Board August 19, 1913, shifts channel below lock No. 18 to avoid rock; changes embankment above lock No. 18; allows concrete for paving at guard-gate; provides for reinforcing old arches, etc., at Mohawk street viaduct; provides steel sheet-piling to prevent undermining of U. & M. V. railway bridge.

River prism, Little Falls to Jacksonburg. Within the river coffer-dam between Stas. 4361 and 4386 only 14,600 cu. yds. of rock were removed during the summer season of 1912, owing to numerous floodings of the site. However, during the months of February and March, 1913, the site was unwatered and the drilling and blasting was completed, leaving the blasted rock to be removed by the dipper-dredge. During this season the prism was coffer-damed between Stas. 4346 and 4361 and 15,400 cu. yds. of rock were removed, as well as 11,000 cu. yds. of stripping. Practically all of the rock has been removed between these limits. Also a drill boat, mounted with three marine drills, has been drilling and blasting in the canal from west of Sta. 4386. The 16-in. hydraulic dredge *General Herkimer* has excavated material at various points in the river prism.

Land line, Jacksonburg to Herkimer. Some excavation has been made and 11,000 cu. yds. of washwall laid. The riprap on the river side of the embankment across the old river channel west of Fort Herkimer has been placed. The 16-in. hydraulic dredge *General Herkimer* has pumped material into the heavy north embankment west of lock No. 18. The 20-ft. wooden sheet-piling in this bank has been completed.

Dam No. 14 and guard-gate. The dam has been completed with the exception of a small amount of paving at the abutments. The guard-gate, including the masonry for the highway bridge and the New York State Railways' bridge, has been entirely completed and the steel work placed. The Mohawk street highway was completed and open to traffic during the latter part of May.

Dredge work west of Herkimer. The 20-in. hydraulic dredge *DeWitt Clinton* has excavated in the river prism at various points between Herkimer and Frankfort, completing the same with the exception of a few places opposite creeks, etc. The dredge has also excavated from the land line west of Frankfort and completed the work of excavating the Frankfort dam approach channel, excepting in front of the spillway. Very slow progress was made during the early part of the summer, on account of the cemented gravel encountered just east of North Frankfort.

Bridges. The masonry work for the East Schuyler and Frankfort bridges and the north abutments of the Ilion bridge has been completed. No steel work has been erected, on account of moving the dredge, although it is expected to have the Frankfort and Ilion bridges completed before winter.

Stream entrances. The stream entrance protections for Fulmer and Steele creeks have been completed, as well as a number of minor structures.

Frankfort dam. Excavation for the dam and spillway have been completed. The riprap protection and paving blocks have been placed for the spillway. It is expected that the dam will be entirely completed this fall.

During the first year of this contract 8.2 per cent was done, during the second year 28.4 per cent, during the third 20.7 per cent and during the fourth 15.4 per cent, making a total of 72.7 per cent completed to September 30, 1913. This contract has overrun the time limit and it will require at least another year to complete it. The work has been much delayed by slides in the heavy clay cut at Washington street and by delays due to changes in plans at this point, as well as by numerous river floods during the summer and fall of 1912, which flooded the rock excavation within the coffer-dam at Little Falls. Otherwise, fair progress has been made, monthly estimate averaging about $45,000.

Up to March 1, 1913, the engineering work on this contract was in charge of George I. Oakley, Resident Engineer, and since that date C. G. Ranney, Assistant Engineer, has been in charge.

The following summary shows the amount of work put under contract and the amount done up to September 30, 1913, including alterations in force and extra work orders:

ITEMS OF WORK.		Preliminary estimate, as affected by alterations to date.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing	lump sum	$1,000	0	$980	0	98
Grubbing	cu. yds.	31,000	3,048	27,896	9.8	90
Excavation	cu. yds.	5,482,671	723,038	4,290,091	13.2	78.3
Sheeting and bracing	ft. B. M.	106,000	4,770	19,630	4.5	18.5
Round timber bracing	lin. ft.	*1,000	850	1,965	85	196.5
Forming embankment	cu. yds.	569,270	130,362	316,683	22.9	55.6
Lining	cu. yds.	5,994	879	2,083	14.7	34.8
Puddle	cu. yds.	300	124	141	41.3	47
Sawed lumber	ft. B. M.	104,300	5,482	14,510	5.3	13.8
Sawed lumber in lock-needles	ft. B. M.	19,000	21,167	21,167	111.4	111.4
White oak in miter-sills and gates	ft. B. M.	9,000	1,104	8,839	12.3	98.2
Foundation piles	lin. ft.	41,762	16,157	29,609	38.7	71
Wooden sheet-piling	ft. B. M.	730,000	232,659	509,185	31.9	69.7
First-quality steel piling	sq. ft.	8,820	2,202	9,220	25	104.5
Second-quality steel piling	sq. ft.	110,000	0	0	0	0
Second-class concrete	cu. yds.	38,817	6,769	32,819	17.4	84.5
Third-class concrete	cu. yds.	130	58.5	129	45	99.2
Second-class reinforced concrete	cu. yds.	746	225	713	30.2	95.6
First-class masonry coping	cu. yds.	5.5	2.17	2.17	39.5	39.5
Dry retaining wall	cu. yds.	5,540	30	4,162	0.5	75.1
Wash wall	cu. yds.	45,850	11,363	17,424	24.8	38
First-class stone paving	sq. yds.	0	0	0	0	0
Second-class stone paving	sq. yds.	340	33	33	9.7	9.7
Third-class stone paving	sq. yds.	663	492	492	74.2	74.2
Cobblestone paving	sq. yds.	410	174	174	42.4	42.4

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* Quantity increased to 3,000 lin. ft. by resolution of Canal Board, December 11, 1912.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations to date.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
First-class riprap....................cu. yds.	1,290	314	964	24.3	74.7
Second-class riprap..................cu. yds.	2,160	777	777	36	36
Third-class riprap....................cu. yds.	2,124	789	891	41.9	37
Fourth-class riprap..................cu. yds.	28,884	2,570	4,451	8.9	15.4
Structural steel..........................lbs.	1,034,050	174,000	208,650	16.8	20.2
Metal reinforcement....................lbs.	76,580	30,720	69,840	40.1	91.2
Iron castings, plain....................lbs.	33,800	437	4,843	1.3	14.3
Iron castings, machined................lbs.	9,850	63	8,992	0.6	91.3
Metal in lock-gates......................lbs.	260,000	0	234,286	90.1	90.1
Metal in buffer-beams..................lbs.	90,000	880	73,552	1	81.7
Metal in look-valves....................lbs.	35,000	0	33,112	0	94.6
Metal in guard-gates....................lbs.	360,000	346,960	346,960	96.4	96.4
Wooden block pavement.............sq. yds.	300	278	278	92.6	92.6
Wooden pavement, 2¾ in. thick.......sq. yds.	0	0	0	0	0
Wooden pavement, 3¾ in. thick.......sq. yds.	620	0	0	0	0
Wooden fence............................lin. ft.	3,294	0	240	0	7.3
Lattice railing.......................... lin. ft.	1,044	581	581	55.6	55.6
Storehouses..............................No.	2	0.12	1.07	6	53.5
Office buildings.........................No.	3	0	1	0	33.3
Crab.......................................No.	1	1	1	100	100
Repointing old masonry..............lin. ft.	18,900	13,881	13,881	73.4	73.4
Maintaining highway traffic........lump sum	$5,000	$300	$3,350	6	67
Maintaining navigation............lump sum	$500	0	0	0	0
Coffer-dams, pumping, etc.........lump sum	$17,000	$2,720	$9,350	16	55
Raising bridge superstructure......lump sum	$1,000	0	0	0	0
Deduct for bridge superstructures removed, lump sum	$500	$300	$300	60	60
Deduct for buildings removed......lump sum	$700	0	$700	0	100
Alteration No. 8.					
Additional coffer-dams, etc.........lump sum	$17,000	$11,730	$13,940	69	82
Alteration No. 11.					
Concrete paving blocks..............sq. yds.	3,350	1,827	1,827	54.5	54.5
Extra Work Orders.					
Removing coffer-dam, contract No. 31, Hansen avenue	....	0	$829 65	0	100
Miscellaneous work at lock No. 18..........	....	$136.02	$136.02	100	100
Painting dam needles.............ft. B. M.	8,025	0	0	0	0
Resetting iron railing, Mohawk St., Herkimer.	....	$87.57	$87.57	100	100

The total work done on Residency No. 4 is summarized by years and contracts in the following table:

CONSTRUCTION WORK.

YEAR ENDED SEPTEMBER 30.	VALUE OF WORK DONE.							
	Contract No. 13.	Contract No. 18.	Contract No. 20-A.	Contract No. 31.	Contract No. 30.	Contract No. 107.	Contract No. 87.	Annual totals, whole residency.
1907..............	....	$76,430	....	....	....	....	....	$76,430
1908..............	....	212,490	....	....	....	....	....	212,490
1909..............	....	92,490	....	$284,050	....	....	....	376,540
1910..............	$9,170	74,610	$41,730	191,390	$212,820	....	....	529,720
1911..............	762	20,959	77,700	187,520	694,550	....	....	981,491
1912..............	....	....	179,990	81,080	615,780	....	....	876,850
1913..............	....	....	21,271	7,302	427,100	$4,380	$7,100	467,153
Totals..........	$9,932	$476,973	$320,691	$751,342	$1,950,250	$4,380	$7,100	$3,520,674

The work on this residency up to March 1, 1913, was in charge of Philip H. Dater, Resident Engineer, who at that time resigned to accept a position in the U. S. Government service.

In conclusion I wish to express the appreciation of the engineers on this residency for the fair and liberal treatment which has been accorded them.

ERIE CANAL, RESIDENCY NO. 4-A.

Resident Engineer Earle Talbot reports:

This residency, with office at 211 Paul building, Utica, has supervision over two Erie canal contracts, one of which is in the Eastern Division and the other in the Middle Division. The extent of the residency is from Sta. 5130, near Sterling creek, to Sta. 5775, which is just east of the Oriskany road, a distance of 12.96 miles.

Contract No. 29, Eastern Division, Maryland Dredging and Contracting Company, contractors, extends from Sta. 5130 to the Herkimer-Oneida county line, a distance of four miles.

Contract No. 42-A, Middle Division, Grant Smith and Company and Locher, contractors, extends from the Herkimer-Oneida county line to Sta. 5775, near Oriskany road, a distance of 8.96 miles.

Contract No. 29.

Maurice Williams is Assistant Engineer in charge of this contract, with office attached to the Residency in Utica.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board February 23, 1910, changes embankment and shore protection on account of soft material, together with incidental changes in structures; changes abutments of Harbor bridge on account of soft material.

Alteration No. 2, approved by the Canal Board June 25, 1910, modifies embankment, wash wall, etc., on account of soft material; lengthens approach spans of West Schuyler bridge on account of soft material.

Alteration No. 3, approved by the Canal Board September 8, 1910, provides sheet-piling in embankments through swamps west of Sterling creek on account of poor material; provides pull boxes for electric wires at locks.

Alteration No. 4, approved by Canal Board September 29, 1910, eliminates wash wall at certain points on account of soft material.

Alteration No. 5, approved by the Canal Board March 22, 1911, omits piling under lock No. 19 and Sterling creek dam as unnecessary.

Alteration No. 6, approved by the Canal Board June 28, 1911, provides sheet-piling for canal banks at Morrisson's swamp on account of poor material.

Alteration No. 7, approved by the Canal Board May 22, 1912, provides steel sheet-piling and concrete wing wall at head of lock No. 19 and under Sterling creek dam on account of difficulty in driving wooden piling; modifies plan for stream entrances to reduce silting.

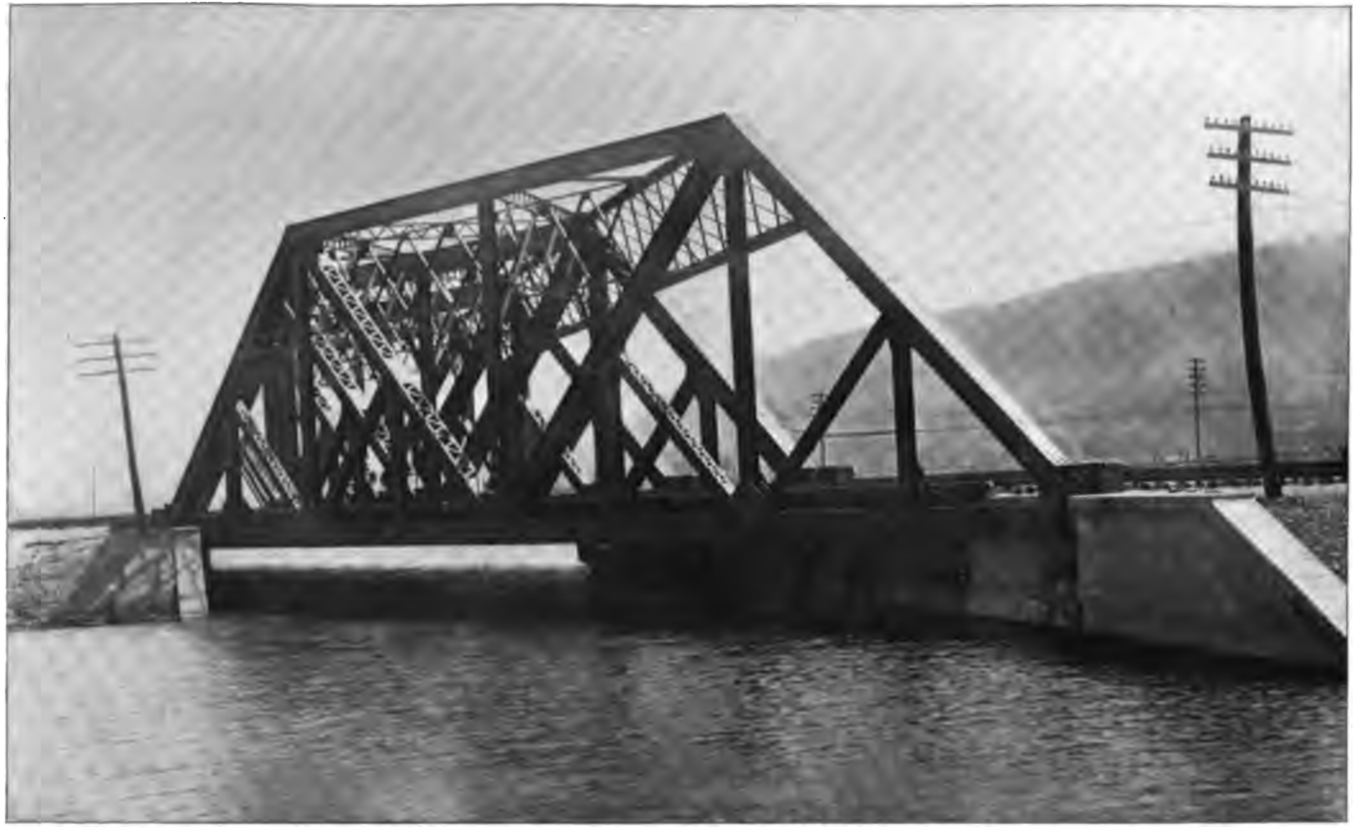
Alteration No. 8, approved by the Canal Board June 11, 1912, provides steel approach spans in place of concrete slabs for West Schuyler bridge to reduce weight on foundations.

Alteration No. 9, approved by the Canal Board September 10, 1912, changes embankment, etc., at west end to match contract No. 42.

Work was begun in June, 1909, by the contractors. The contract time for completion was December 31, 1911, but was extended a year, owing to alterations in the original contract and delay in the New York Central railroad work east of lock No. 19.

The railroad tracks were originally shifted to a temporary detour east of the final location, to permit of the construction of the railroad bridge, which adjoins lock No. 19 on the east. The bridge was completed in the fall of 1912, but the trains have not been shifted back from the detour to the bridge.

The detour interposes a dike across the canal which cuts off all drainage from the lock and west into the lower, or river level. In addition to this it has been impossible for the contractors to have a dredge brought up from the river to take out the detour and complete the prism excavation from the lock west. The contractors made application for the site of the contract, and failing to secure this have suspended all construction on contract No. 29. No work has been done since February, 1913, and practically all of the plant has been moved to other work or sold.



Barge Canal, Contract No. 29.

View showing completed New York Central & Hudson River railroad bridge spanning the Barge canal in the vicinity of Sterling creek. This bridge has not as yet been used by the Railroad Company.

UNIV. OF MICH.

During the first five months of the fiscal year the contractors' force was small and progress was also delayed by unfavorable weather conditions. Contractors' operations were practically closed December 31, 1912.

The concrete work at lock No. 19 was completed, except some finishing to be done at the machinery recesses and tops of walls. The gates, buffer-beams and valves were placed, the upper gates and valves being closed. Pumps were withdrawn February 13, 1913.

Sterling creek dam was completed, with the exception of the outer wings of the abutments.

The north canal bank through Sterling swamp and Morrison swamp was completed by excavating from spoil bank west of Sterling creek with steam-shovel and transporting materials by trains.

The dive culvert at Sta. 5289 + 95 has been half completed, from the north end. Sheeting and foundation piles are driven for the south half.

A large quantity of stone for wash wall, riprap and paving has been delivered on the contract site, and some of it placed at Schuyler and Harbor bridges, Schuyler bridge culvert, ditch entrance at Sta. 5279 + 53 and at the spillway at Sta. 5292 + 75.

The attached table shows the amounts of work done under contract items until operations were suspended and the total progress of the work to date:

ITEMS OF WORK.		Preliminary estimate, as affected by alterations Nos. 1 to 9.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing	lump sum	1	0	95%	0	95
Grubbing	cu. yds.	61,670	0	42,942	0	69.7
Excavation	cu. yds.	1,179,655	5,851	784,060	0.5	66.5
Sheeting and bracing	ft. B. M.	180,500	3,100	171,600	1.7	95.1
Round timber	lin. ft.	*2,500	221	1,433	8.8	57.3
Embankment	cu. yds.	331,557	12,889	259,866	3.9	78.4
Lining	cu. yds.	2,503	123	1,302	4.9	52
Sawed lumber	ft. B. M.	36,200	300	18,700	0.8	51.7
White oak lumber	ft. B. M.	8,000	7,100	7,100	88.7	88.7
Foundation piles, 12 to 30 ft. long	lin. ft.	12,970	3,192	13,205	24.6	101.8
Wooden sheet-piling	ft. B. M.	662,800	17,800	532,400	2.7	80.3
Steel sheet-piling	sq. ft.	5,410	205	3,845	3.8	71.1
Second-class concrete	cu. yds.	34,358	1,765	27,445	5.1	80
Second-class reinforced concrete	cu. yds.	92	0	85	0	92.4
Masonry coping	cu. yds.	4	0	0	0	0
Wash wall	cu. yds.	8,900	537	537	6	6
First-class paving	sq. yds.	2,900	56	56	1.9	1.9

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* Increase authorized by resolution of Canal Board, July 11, 1912.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1 to 9.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Third-class paving .... sq. yds.	300	0	0	0	0
First-class riprap .... cu. yds.	600	0	0	0	0
Second-class riprap .... cu. yds.	670	39	39	5.8	5.8
Third-class riprap .... cu. yds.	633	6	6	0.9	0.9
Fourth-class riprap .... cu. yds.	6,307	436	532	6.9	8.4
9-in. vitrified pipe .... lin. ft.	31	0	0	0	0
30-in. vitrified pipe .... lin. ft.	41	0	36	0	87.8
Structural steel .... lbs.	412,300	7,768	285,133	1.9	69.1
Metal reinforcement .... lbs.	104,700	21,062	90,440	20.2	86.4
Iron castings, plain .... lbs.	13,600	315	315	2.3	2.3
Iron castings, machined .... lbs.	9,500	0	8,582	0	90.5
Metal in lock-gates .... lbs.	250,000	92,403	233,286	37	93.3
Metal in buffer-beams .... lbs.	78,000	41,752	72,877	53.5	93.4
Metal in lock-valves .... lbs.	35,000	30,511	30,511	87.2	87.2
Wooden pavement .... sq. yds.	880	0	737	0	83.8
Wooden fence .... lin. ft.	2,390	0	2,074	0	86.8
Maintaining highway traffic .... lump sum	1	0	80%	0	80
Storehouse .... lump sum	1	0	0	0	0
Office building .... lump sum	1	0	100%	0	100
Coffer-dams, pumping, etc .... lump sum	1	8.8%	85.3%	8.8	85.3

Apparent percentage of work completed to date = 70.2 per cent.
Actual percentage of work completed to date = 78.0 per cent.

ERIE AND CHAMPLAIN CANALS, RESIDENCY NO. 1-A.

Assistant Engineer A. R. Morse reports:

Contract No. 92.

For constructing power plants, electrical equipment and machinery for operating and lighting locks and guard-gate as follows: Erie canal locks Nos. 2 to 19, inclusive, and guard-gate at Sta. 293 + 70; Champlain canal locks Nos. 1 to 8, inclusive.

This contract was let to the MacArthur Bros. Co.–Lord Electric Co. for $1,178,976 and placed under contract February 17, 1913.

Erie Canal, Section No. 1.

G. M. Rodger, Assistant Engineer, in charge.

The work on this section, which consists of a transmission line from the power house at Crescent dam to lock No. 3, a cabin for the operation of the guard-gate at the entrance to the land line, a substation at lock No. 5 for operating locks Nos. 6, 5 and 4, and a substation at lock No. 3 for locks Nos. 3 and 2, was started April 7, 1913.

At Lock No. 2. Drilling and chipping for ducts are practically finished.

At Lock No. 3. The substation is completed, with the exception of the woodwork and painting. Drilling and chipping for ducts and trenching for armored conductors are well under way. Changes in upper gate machinery recesses are completed. The metal duct is placed from the substation to the end of the light line on the upper left approach walls.

At Lock No. 4. Drilling and chipping for ducts are practically completed and installation of metal duct is started on the approach walls.

At Lock No. 5. The substation, with the exception of woodwork and painting, is practically completed, as is also the chipping and drilling. The metal duct on the lower left approach wall is nearly all in position.

At Lock No. 6. Drilling and chipping are nearly finished.

At Guard-gate. The excavation for the cabin is completed and forms for the substructure started.

Transmission Line. The 94 concrete poles with their bases are completed and material for cross arms and insulators have been received.

Erie Canal, Section No. 2.

W. R. Abbott, Assistant Engineer, in charge.

The work on this section calls for the construction of one hydro-electric power station at lock No. 7 and three gasolene electric stations, one each at locks Nos. 8, 9 and 10, for furnishing power for operating locks and movable dams.

The work on this section is just getting under way, having been started September 5, 1913. The excavation is completed for power house substructures at locks Nos. 9 and 10.

Erie Canal, Section No. 3.

H. C. Kline, Assistant Engineer, in charge.

The contract calls for five gasolene electric stations, at locks Nos. 11, 12, 13, 14 and 15, and a hydro-electric station at lock No. 16.

The work on this section was started September 12, 1913. The excavation for the substructures of stations at locks Nos. 11, 14 and 15 is practically completed.

Erie Canal, Section No. 4.

The work on this section comprises three-hydro-electric power stations at locks Nos. 17, 18 and 19, with a transmission line from lock No. 17 to the German street bridge at Little Falls.

No work has started on this section.

Champlain Canal, Section No. 1.

B. T. Kenyon, Assistant Engineer, in charge.

The contract on this section calls for the construction of five hydro-electric power stations at locks Nos. 1, 2, 3, 4 and 5.

Work on this section was started August 16, 1913. The concrete for the power house at lock No. 5 is practically in place except floors and stairs.

Champlain Canal, Section No. 2.

C. A. Curtis, Assistant Engineer, in charge.

The work on this section consists of two hydro-electric power stations, one at lock No. 6 and one at lock No. 8, together with a transmission line from lock No. 8 to lock No. 7. Work was started April 7, 1913.

At Lock No. 6. The power house is completed with the exception of woodwork, painting and floor. The drilling and chipping are well under way. Hand operating machinery for two valves has been delivered.

At Lock No. 7. The drilling is practically completed.

At Lock No. 8. Drilling is finished and plant removed. The power house is complete except floor, painting and woodwork.

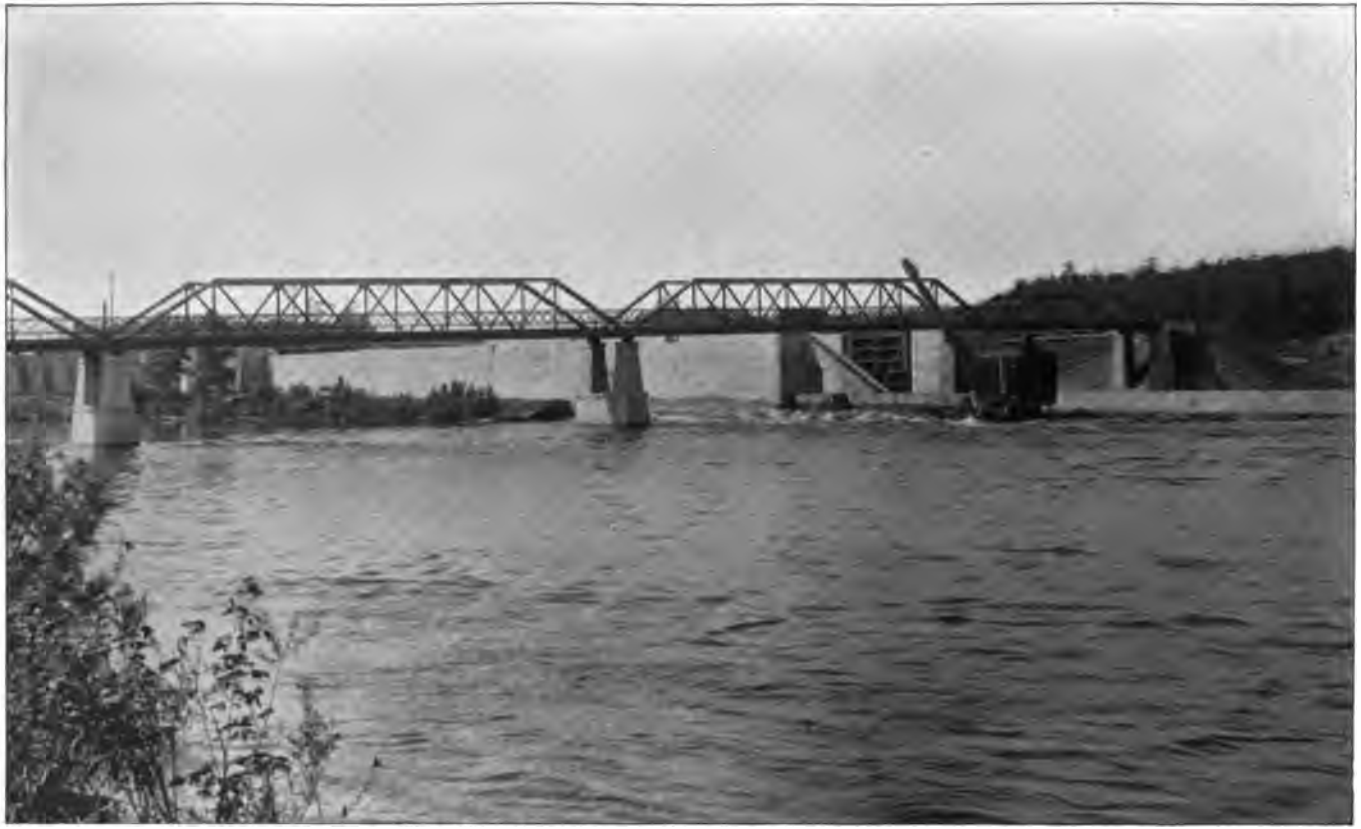
The total contract is 2.1 per cent completed.

CHAMPLAIN CANAL, RESIDENCY NO. 1.

Resident Engineer F. B. Williams reports:

This residency extends from the connection with contract No. 1, north of the guard-lock at Northumberland, to the junction with the Erie canal at Waterford. Length, about 27 miles.

Appropriation surveys. Appropriation surveys were made for two parcels of appropriated land on contract No. 70-A, and 19 parcels of appropriated land on contract No. 71-A, also 19 maps on contract No. 71-A, covering the flowage rights, and two maps for spoil purposes were prepared. The necessary searches were made in the office of the county clerk for these maps.



BARGE CANAL, CONTRACT NO. 69.
View showing bridge constructed at the lower end of lock No. 2, south of Mechanicville.

Gage readings. Daily gage readings of five gages between lock No. 1 and lock No. 2 have been taken; also daily gage readings at five points in the vicinity of Stillwater dam have been taken.

The office work has consisted in making out and checking estimates, and making miscellaneous computations, drawings, estimates and reports.

The field work has consisted in staking out work and inspecting construction on the various contracts in force.

Below is given a concise description of the several contracts in this residency:

Contract No. 68 provides for constructing, in the Hudson river, lock No. 3 at Mechanicville, lock No. 4 at Stillwater and lock No. 5 at Northumberland, together with accompanying land lines. Length, about 1.4 miles. Contract completed in 1912.

Contract No. 69 provides for constructing, in the Hudson river, lock No. 2 below Mechanicville. Length, 0.17 mile. Contract completed in 1913.

Contract No. 88 provides for the reconstruction of a portion of the bridge crossing the Hudson river at Schuylerville. Contract completed in 1913.

Contract No. 70 is for dredging a channel in the Hudson river and performing incidental work between Waterford and lock No. 1. Length, 3.32 miles. Contract cancelled.

Contract No. 70-A is for completing the excavation of a channel in the Hudson river and performing work incidental thereto from Waterford to lock No. 1. Length, about 3.32 miles. Contract price, $759,158.

Contract No. 71 provides for constructing, in the Hudson river, lock and dam No. 1 above Waterford, and dredging a prism between lock No. 1 and lock No. 2. Length, 3.96 miles. Contract cancelled.

Contract No. 71-A provides for completing the construction, in the Hudson river, of lock and dam No. 1 above Waterford, and dredging from lock No. 1 to lock No. 2, with all appertaining construction. Length, about 3.96 miles. Contract price as affected by alteration No. 1, $1,286,389.

Contract No. 72 is for dredging the Hudson river from lower Mechanicville to Stillwater. Contract cancelled.

Contract No. 72-A is for completing the excavation of a channel in the Hudson river and performing work incidental thereto from lock No. 2 to lock No. 4 and for completing the construction of the upper approach wall of lock No. 3. Length, 4.1 miles. Contract price, $1,534,603.25.

Contract No. 73 provides for dredging a channel in the Hudson river and performing work incidental thereto from Stillwater to Northumberland. Length, 15.0 miles. Contract completed.

More detailed descriptions of contracts Nos. 69, 88, 70-A, 71-A and 72-A, on which work has been in progress during the year, follow:

Contract No. 69.

This contract was let to I. A. Hodge & Co., Inc., December 11, 1909. The work commenced as soon as the contract was let and has continued without interruption until completed.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board August 27, 1912, changes plans for power plant, ladders in guide wall, conduits for wires, etc., to conform to standards.

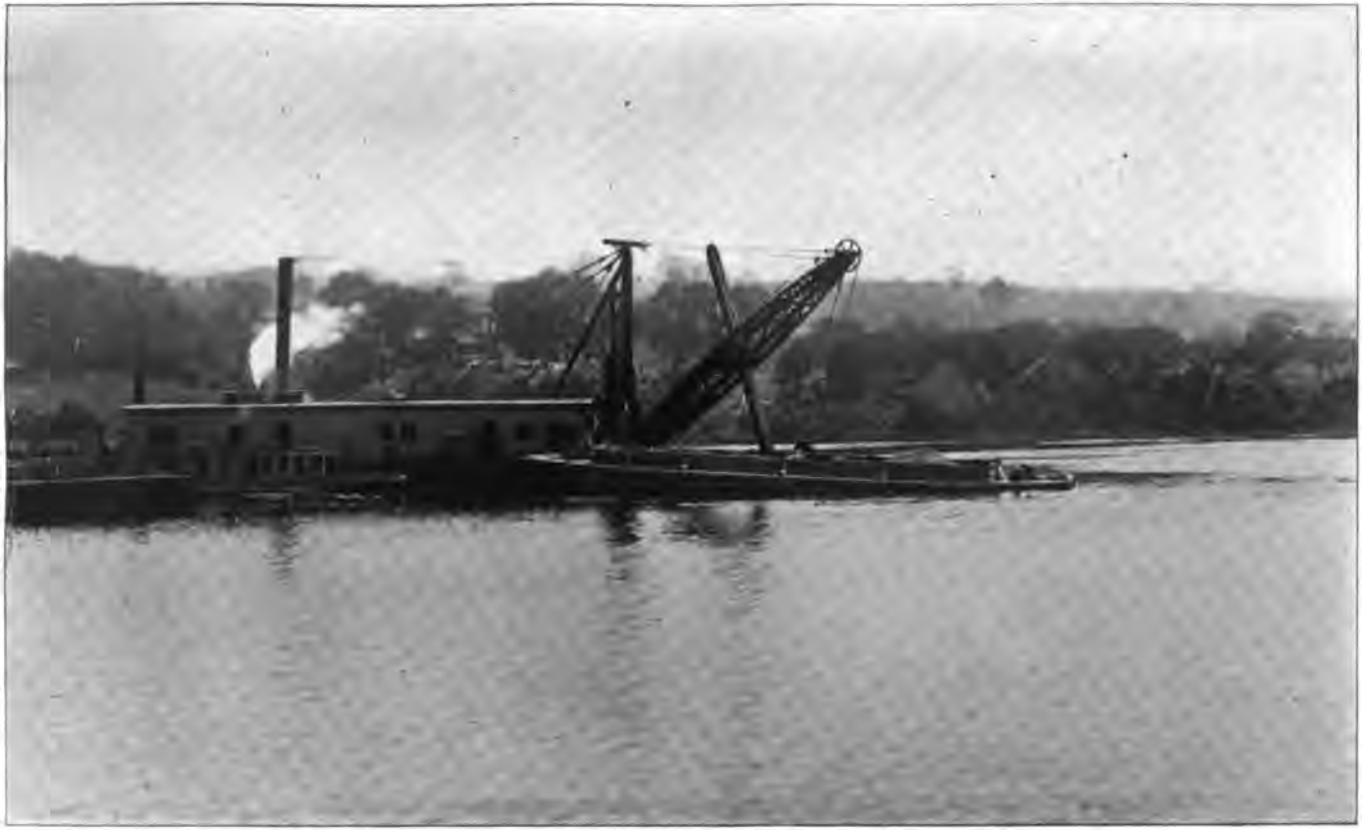
Alteration No. 2, approved by the Canal Board April 18, 1913, eliminates excavation remaining unfinished and transfers to adjoining contract at no increased cost.

The construction of the power house and the construction of the upper guide wall, begun at the close of the last report, was finished at the end of 1912.

The construction of the store house was begun in December and completed in January, and the grading, paving and fencing of bridge approaches and miscellaneous items were completed during these months, with the exception of a small amount of excavation at either end of the lock, which required dredging. The removal of this material was arranged for under the terms of alteration No. 2, executed in April, 1913, and the contract was closed up.

The amount of the final estimate as approved is $231,504, or about 97 per cent of contract price after deducting the unfinished excavation.

The flood of March 28 reached a height of 2.3 feet over the top of the east retaining wall above the lock, going over the top of



BARGE CANAL, CONTRACT NO. 70-A.
View showing dipper dredge and scow operating in the Hudson river north of Waterford.

the lock head walls and washing out the filling east of the lock to some extent.

A portion of the plant was removed during the spring and a portion is at site, which will probably be employed on the contract for completing the power house.

B. T. Kenyon, Assistant Engineer, was in charge of the work.

The following table shows the amount of the work done during the year and to date, with percentages:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing . . . . lump sum	. . . .	0	100%	0	Contract completed.
Excavation . . . . cu. yds.	74,960	4,744	68,208	7	
Sheeting and bracing . . . . ft. B. M.	5,000	†3	3,137	. . . .	
Round timber bracing . . . . lin. ft.	500	0	423	0	
Forming embankment . . . . cu. yds.	100	0	0	0	
Sawed lumber, yellow pine or Douglas fir. ft. B. M.	6,000	1,309	5,459	24	
White oak lumber in miter-sills and lock-gates, ft. B. M.	9,000	1,575	9,470	16.6	
Second-class concrete . . . . cu. yds.	19,946	1,553.8	20,199 8	7.7	
Second-class reinforced concrete . . . . cu. yds.	61 5	7.6	55.6	13.7	
First-class masonry coping . . . . cu. yds.	2	0.99	0.99	100	
Third-class stone paving . . . . sq. yds.	200	187	187	100	
Third-class riprap . . . . cu. yds.	100	90	90	100	
Fourth-class riprap . . . . cu. yds.	100	0	0	0	
Structural steel . . . . lbs.	183,370	6,013	174,174	3.5	
Metal reinforcement . . . . lbs.	17,670	1,875	12,525	15	
Iron castings, plain . . . . lbs.	7,600	4,178	8,008	52 1	
Iron castings, machined . . . . lbs	8,600	†8	8,232	. . . .	
Metal in lock-gates . . . . lbs.	260,000	118	241,920	0.65	
Metal in buffer-beams . . . . lbs.	77,000	†641	72,450	. . . .	
Metal in lock-valves . . . . lbs.	34,000	32	32,044	0.1	
Wooden pavement . . . . sq. yds.	440	1	428	2 3	
Wooden fence . . . . lin. ft.	340	378	378	100	
Drilling bolt holes in rock . . . . lin. ft.	*490	36	462	7.8	
Coffer-dams, pumping, baling and draining, lump sum	. . . .	40%	100%	40	
Office building . . . . lump sum	. . . .	0	100%	0	
Storehouse . . . . lump sum	. . . .	100%	100%	100	

* Increased by 180 lin. ft.
† A decrease.

Contract No. 88.

This contract, which requires the reconstruction of a portion of the bridge crossing the Hudson river at Schuylerville, was let to Lathrop, Shea & Henwood Company, November 4, 1911.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board September 25, 1912, provides 2-inch plank wearing floor and pile foundations for piers, for better construction.

Alteration No. 2, approved by the Canal Board November 12, 1912, provides new abutment and reduces grade at west end of bridge,— old abutment in poor condition.

The construction of the east pier, commenced at the close of last year's report, was completed in November, after considerable delay by high water.

As it was found that the west abutment was in poor condition, alteration No. 2 was made in November, 1912, requiring the construction of a new abutment and changing the grade of the west approach to an easier grade.

The old spans were raised to grade and concrete caps placed on the piers and the construction of the west abutment was completed in December.

The erection of steel was commenced in December and the riveting completed early in February, the flooring being completed soon after.

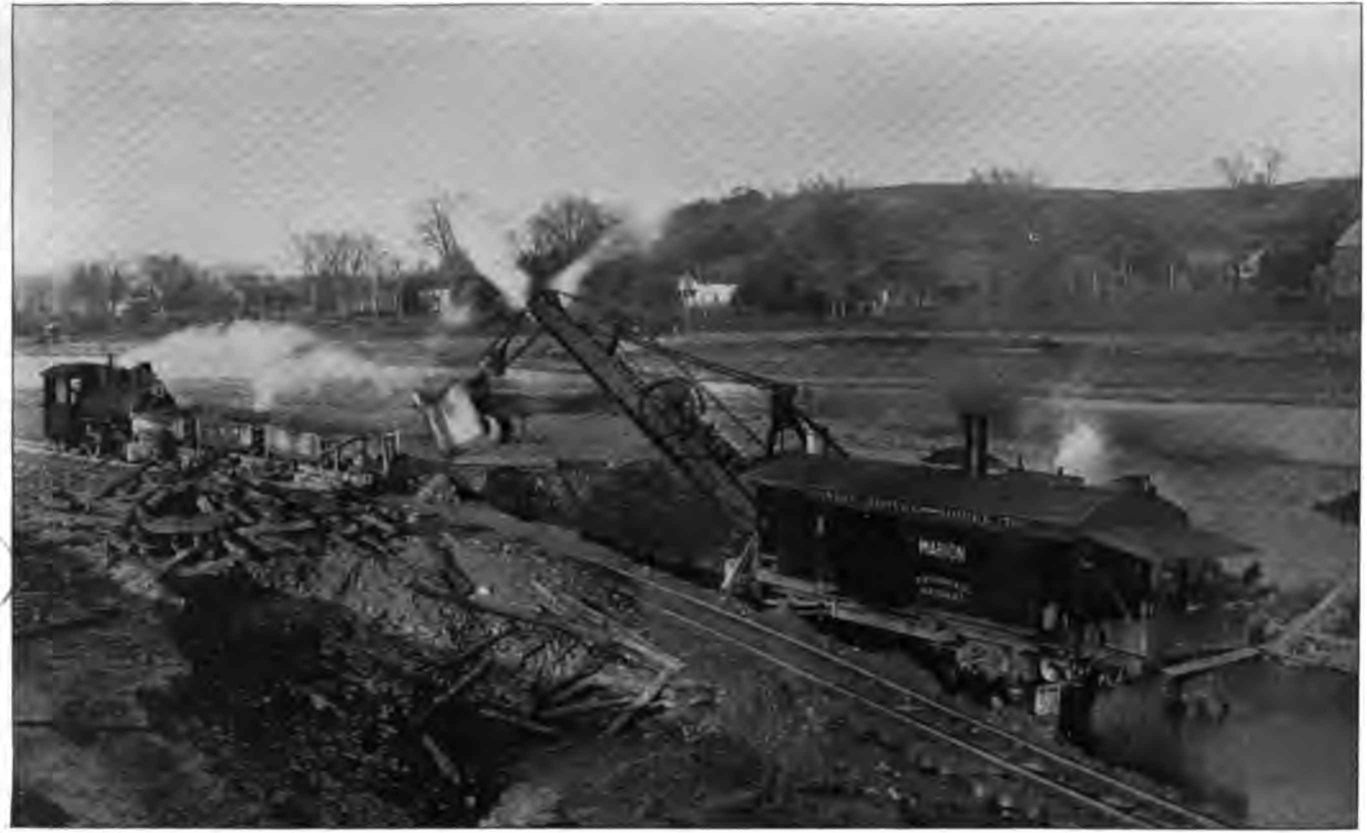
Highway traffic was maintained by ferry until February 22, with minor interruptions on account of high water, when the bridge was opened to traffic. However, on account of the poor condition of the old spans of the bridge, the county superintendent of Washington and Saratoga counties closed the bridge to traffic immediately and the bridge has been out of use up to date, pending some arrangement for rebuilding the old spans, which compose that portion of the structure not built new by state across the barge canal channel.

The final estimate was approved in June, 1913, for $30,844, or 86 per cent of the contract price.

W. T. Hunt, leveler, was in charge of the contract.

The following table shows the amount of work done during the year and to date, with percentages:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation .... cu. yds.	4,100	1,027	1,538	67.5	Contract completed.
Sheeting and bracing .... ft. B. M.	10,000	3,602	3,602	100	
Round timber bracing .... lin. ft.	1,000	64	64	100	
Sawed lumber .... ft. B. M.	18,800	18,978	18,978	100	
Second-class concrete .... cu. yds.	1,235	708.7	1,084.7	65.4	
Fourth-class riprap .... cu. yds.	70	0	0	0	
Structural steel .... lbs.	161,700	163,096	163,121	100	
Metal reinforcement .... lbs.	660	327	597	54.8	
Iron castings, plain .... lbs.	2,600	702	1,310	53.5	
Wooden pavement .... sq. yds.	352	351	351	100	
Coffer-dams, pumping, bailing and draining, lump sum	....	50%	100%	50	
Maintaining highway traffic .... lump sum	....	50%	100%	50	
Rebuilding spans, 2 and 6 .... lump sum	....	100%	100%	100	
Raising spans, 1, 7 and 8 .... lump sum	....	100%	100%	100	
Removing bridge structure .... lump sum	....	100%	100%	100	



BARGE CANAL, CONTRACT NO. 71-A.
Steam-shovel working within coffer-dam in the Hudson river south of Mechanicville.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Foundation piles . . . . . lin. ft.	5,650	4,726	4,726	100	Contract completed.
Wooden sheet-piling . . . . . ft. B. M.	28,800	13,446	13,446	100	
Embankment . . . . . cu. yds.	140	161	161	100	
Lining . . . . . cu. yds.	85	50	50	100	
Maintaining highway traffic, alteration No. 2, lump sum	. . . .	100%	100%	100	
Raising spans 1 and 2 . . . . . lump sum	. . . .	100%	100%	100	

Contract No. 70-A.

This contract was let October 22, 1912, to the Central Dredging Company. In February, 1913, the Dunbar & Sullivan Dredging Company secured a subcontract for the work and began erecting a plant. Since that time the work has been in progress. Because of the delay in opening the Troy lock to navigation, on account of repairs, the dump-scows did not reach the site until late in July, and actual progress in excavating the prism was delayed until that time.

The method to be employed in handling the prism excavation on the contract is to use a dipper-dredge and other dredges equipped with grab-buckets, and to load the material on scows, which are towed to a spoil bank located at about the center of the contract. At this central spoil bank, located on the O'Houlihan farm, a channel is dug along the center of the spoil area, into which the scows are towed and dumped. Two large traveling excavators, one on each side of the channel, scoop up the material thus dumped and place it in piles along the channel. The excavators are used for excavating the channel for the dump-scows as rapidly as required.

The excavators were received during the winter and erected in the spring. The dipper-dredge, secured from contract No. 71, was moved to this contract in March. Several steel pontoons, two dredge-hulls, four dump-scows and miscellaneous plant was received in July.

From the time of the arrival of the scows in July, prism excavation has continued between Sta. 1310 and Sta. 1336, near the Waterford Country Club, a second shift being put on about the middle of September.

At the close of the fiscal year preparations are being made to place a second dredge in operation.

John McBride, Assistant Engineer, has been in charge of the work on this contract.

The following table shows the amount of work done to date, with percentages:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing ... lump sum	$1,000	$200	$200	20	20
Excavation ... cu. yds.	522,152	30,687	30,687	5.8	5.8
Sheeting and bracing ... ft. B. M.	2,000	0	0	0	0
Forming embankment ... cu. yds.	300	0	0	0	0
Lining ... cu. yds.	210	0	0	0	0
Second-class concrete ... cu. yds.	140	0	0	0	0
Wash wall ... cu. yds.	1,000	0	0	0	0
First-class riprap ... cu. yds.	200	0	0	0	0
Second-class riprap ... cu. yds.	200	0	0	0	0
Third-class riprap ... cu. yds.	200	0	0	0	0
Fourth-class riprap ... cu. yds.	200	0	0	0	0
Iron castings, plain ... lbs.	6,500	0	0	0	0

Contract No. 71-A.

This contract was let to P. McGovern & Co., January 16, 1913, and work was commenced soon after the letting of the contract and steady progress has been made to date. Some of the plant of the previous contractor was secured for the work.

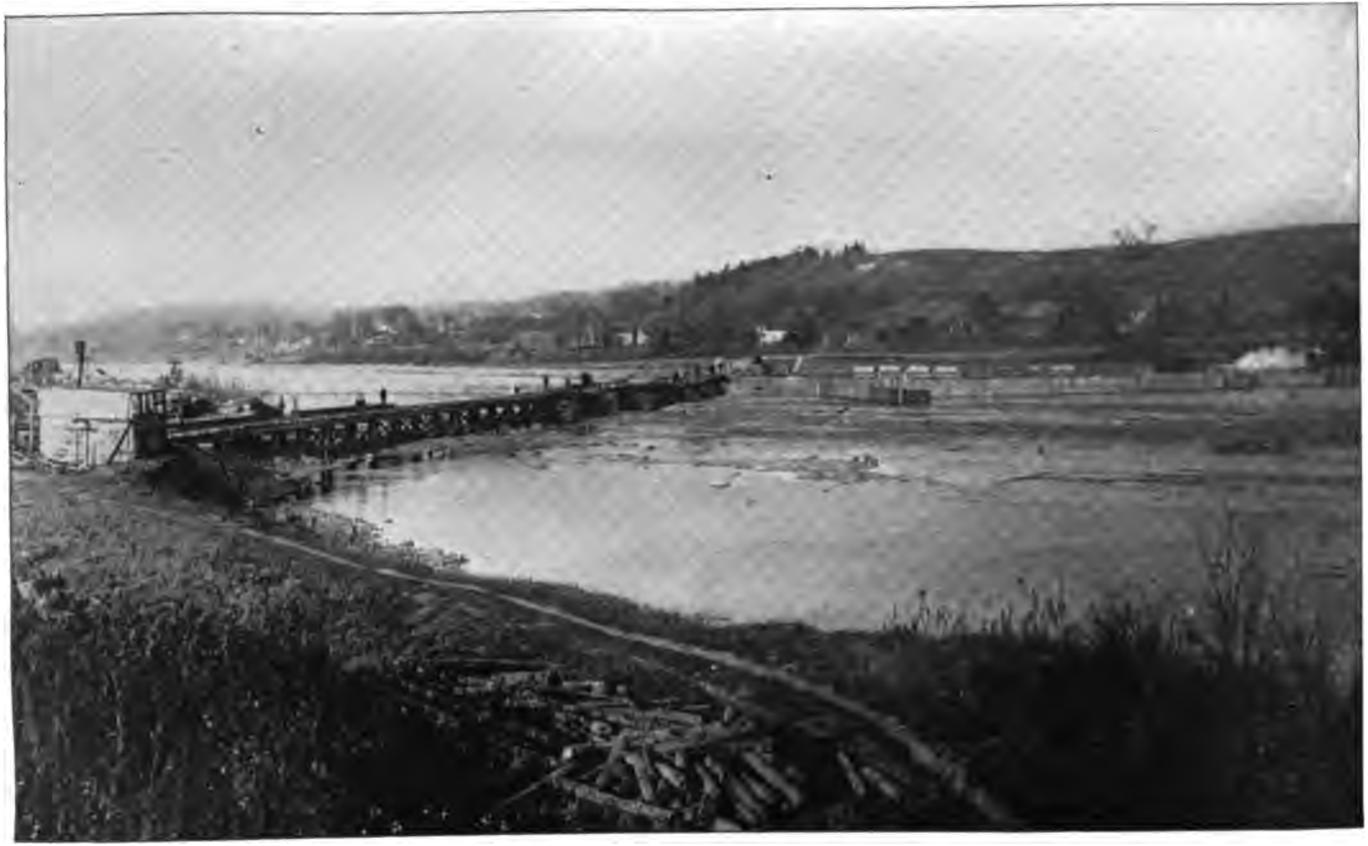
This contract has been modified by an alteration as follows:

Alteration No. 1, approved by the Canal Board September 9, 1913, provides facing wall for rock slope below lock No. 1, and for Taintor gates in dam No. 1 to take care of floods.

The description of the work will be commenced at the north end of the contract and continued south.

A coffer-dam has been completed north from the Webster's coffer-dam to Sta. 1057, a distance of 2,000 feet, and is expected to be unwatered about October 1, and the plant released from Webster's will be employed in progressing the work during the fall and winter.

At Webster's (Stas. 1076–1094) the old coffer-dam was repaired from Sta. 1084 to Sta. 1094 and extended up-stream to Sta. 1076 and unwatered early in July. The material was excavated with steam-shovel and cars, and spoiled on west bank. At the end of the fiscal year the prism excavation is complete and the plant is being moved north to the coffer-dam at Sta. 1070.



BARGE CANAL, CONTRACT NO. 71-A.

View showing coffer-dam in the Hudson river south of Mechanicville, with trestle extending across the river to the spoil banks. Over this trestle the excavated material is handled in cars.

The old coffer-dams on the east side of the prism opposite Wright's have been removed by teams and the material spoiled in the bay along the east bank.

At Russell's (Stas. 1098–1212) this coffer-dam between Stas. 1098 and 1212 has been completed and the excavation with steam-shovel was commenced the last of September, the drainage being carried through to the pumps at lock No. 1.

At Morrow's and Slade's the work of excavating prism inside the coffer-dams between Sta. 1212 and lock No. 1 was completed during the summer. Steam and air drills were used in drilling the rock. Steam-shovel, locomotives and cars were used in removing the spoil to dike west of lock No. 1.

At lock No. 1 the excavation and concrete for the remainder of the east wall of the lock is nearly completed. The tower and chute method is employed in depositing concrete. Work on the lower guide-wall and new guide-wall on the west side, added by alteration No. 1, is in progress. The upper lock-gates have been erected and riveting was commenced the last of September. The fitting of white oak quoin posts and the placing of the valves is in progress.

In September, 1913, alteration No. 1 was made, changing the location of the fixed crest dam and providing a section at the east end with six 50-foot Taintor gates with sills 14.5 feet below the crest of the fixed dam. This change was necessary as the flood of March 28 gave a discharge approximately double the quantity for which the original design was made. A retaining wall on the west side of the lower prism, replacing the sloping bank protection, was also included in the alteration, in order to improve navigation.

At dam No. 1 the excavation of about 125 feet at the west end of the dam was completed in the summer and work suspended, pending the change of plans, which were completed in September and work recommenced on September 17.

About 9,000 lineal feet of prism have been coffered off during the season and about 70 acres of river bed unwatered for operations. The river and weather conditions up to October 1 have been favorable for the work and good progress has been made.

R. D. Hayes, Assistant Engineer, is in charge of this contract.

The following table shows the amount of work done to date, with percentages:

ITEMS OF WORK.	Preliminary estimate, as affected by alteration No. 1.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing........................lump sum	$250	0	0	0	0
Excavation........................cu. yds.	401,606	106,439	106,439	26.5	26.5
Sheeting and bracing..............ft. B. M.	20,000	0	0	0	0
Round timber bracing...............lin. ft.	500	0	0	0	0
Forming embankment...............cu. yds.	*620	569	569	91.8	91.8
Lining............................cu. yds.	100	0	0	0	0
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	1,500	0	0	0	0
White oak lumber in miter-sills and lock-gates, ft. B. M.	10,470	0	0	0	0
Second-class concrete...............cu. yds.	21,776	4,513	4,513	20.7	20.7
Second-class reinforced concrete......cu. yds.	320	63	63	19.7	19.7
Wash wall.........................cu. yds.	420	0	0	0	0
Third-class stone paving.............sq. yds.	490	0	0	0	0
First-class riprap...................cu. yds.	300	0	0	0	0
Second-class riprap..................cu. yds.	1,480	0	0	0	0
Third-class riprap...................cu. yds.	300	0	0	0	0
Fourth-class riprap..................cu. yds.	216	0	0	0	0
Structural steel.........................lbs.	99,033	7,948	7,948	8	8
Metal reinforcement...................lbs.	19,823	4,144	4,144	20.9	20.9
Iron castings, plain.....................lbs.	12,910	2,400	2,400	18.5	18.5
Iron castings, machined.................lbs.	2,783	2,175	2,175	78.1	78.1
Metal in lock-gates......................lbs.	235,561	6,413	6,413	2.8	2.8
Metal in buffer-beams...................lbs.	44,824	3,785	3,785	8.4	8.4
Metal in lock-valves....................lbs.	32,821	14,516	14,516	44.2	44.2
Drilling bolt holes in rock............lin. ft.	450	0	0	0	0
Coffer-dams, pumping, bailing and draining, lump sum	$20,000	13.36%	13.36%	13.36	13.36
Storehouse.......................lump sum	$1,000	0	0	0	0
Deduct for buildings..............lump sum	$100	0	0	0	0

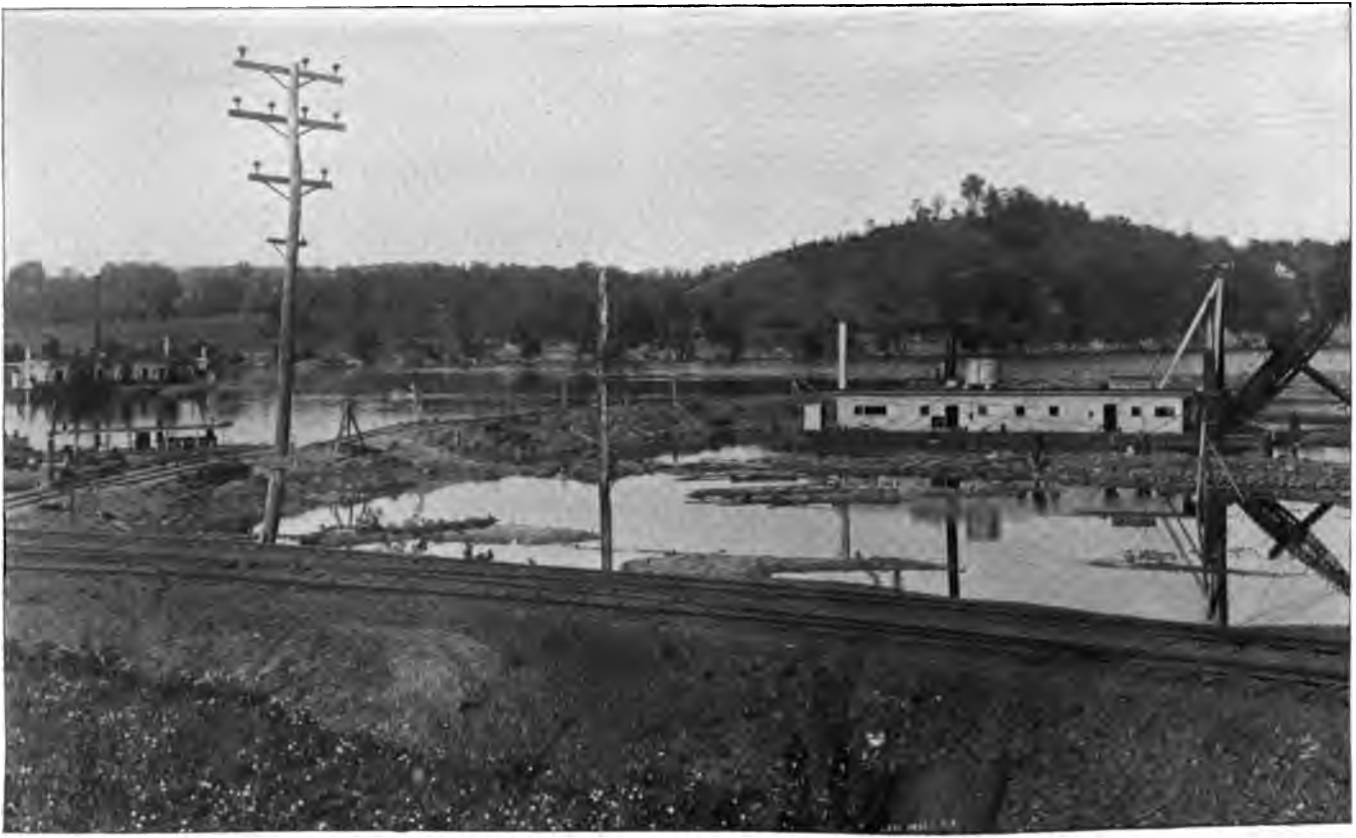
* Increase of 300 cu. yds. approved by resolution of Canal Board dated September 24 1913.

Contract No. 72-A.

This contract was let March 17, 1913, to James Stewart & Co., Inc., and work was commenced immediately. A large portion of the plant from contract No. 72 was secured for the work. The hydraulic dredge sunk in lock No. 3 was raised in May, repaired and taken to the upper pool for work. The steam-shovel left sunk in Green island coffer-dam in 1911 was recovered when work was unwatered this summer and again placed in service.

The description of the work will be commenced at the north end of the contract and continued south.

At Green Island (coffer-dam Sta. 841 to Sta. 855) the old coffer-dams were repaired and strengthened, but, owing to leaks, little progress was made until the middle of September. Steady progress has been made since that time to date, material being excavated by steam-shovel and spoiled with narrow-gage equipment on the east slope of Green island. A large pump and additional boiler capacity were added in September.



Barge Canal, Contract No. 72-A.
Dipper dredge working within coffer-dam in the Hudson river in the vicinity of Mechanicville.

The hydraulic dredge, after assisting with the work at Green island, has been at work removing the overburden north and south of the B. & M. R. R. bridge, in order that rock can be drilled. The dredge is located just south of the bridge at the close of the fiscal year. The material was pumped to the Mabb parcel and to the spoil bank on the Paper Company lands along east shore.

At lock No. 3 a siding is maintained for receiving coal and supplies for the plant employed on the upper pool.

At Second island (Sta. 966 + 80 to Sta. 982 + 50) excavation inside of the coffer-dam was commenced at the end of July and continued steadily to date, the work being over half done at the end of the fiscal year. The material is excavated with steam-shovel and is being spoiled between First and Second islands, in standard gage cars. Between Second island and Hart's coffer-dams the rock has been all drilled by means of the drill boat. On July 28 the drill boat was struck by lightning and was laid up two weeks for repairs.

At Hart's coffer-dam (Stas. 995–1017) the excavation was completed in August and the removal of the coffer-dam is in progress.

Between Hart's and lock No. 2 the drill boat is at work. All material excavated south of Second island since the finishing of the work inside of Hart's coffer-dam has been spoiled east of Quock island, two dump scows and two tugs being employed in handling the material.

W. L. Caler, Assistant Engineer, is in charge of this contract.

The following table shows the amount of work done to date, with percentages:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... lump sum	1	....	....	....	....
Excavation .... cu. yds.	540,939	139,258	139,258	25.7	25.7
Sheeting and bracing .... ft. B. M.	2,000	0	0	0	0
Round timber bracing .... lin. ft.	400	0	0	0	0
Stone filling in cribs .... cu. yds.	2,400	0	0	0	0
Rock spoil filling .... cu. yds.	1,000	0	0	0	0
Structural steel .... lbs.	9,000	0	0	0	0
Iron castings, plain .... lbs.	5,800	0	0	0	0
Sawed lumber .... ft. B. M.	180,000	0	0	0	0
Completing construction of upper approach wall, lock No. 3 .... lump sum	1	0	0	0	0

CHAMPLAIN CANAL, RESIDENCY NO. 2.

Resident Engineer E. V. R. Payne reports:

Residency No. 2, Champlain canal, extends from the Northumberland bridge across the Hudson river northerly to the highway bridge at Dunhams Basin, Washington county, and includes the Glens Falls feeder and dam.

The following contracts are located within this residency: Nos. 1, 3, 3-A, 24, 26, 27, 27-A, 54 and 56, and portions of 7, 16 and 32.

Contracts Nos. 3, 3-A, 26, 27, 7 and 32 were completed prior to October 1, 1912; contracts Nos. 16 and 54 were completed during the year; no construction work was done on contract No. 1, and work progressed on contracts Nos. 24, 27-A and 56.

Work Done.

The work has consisted of general office work; revision of appropriation maps for flooding purposes; reports on damaged land and contractors' claims for Board of Claims; preparation of various estimates of quantities for contract No. 1; compiling of final estimates for contracts Nos. 1, 16, 27-A and 54, and preparation of contract plans for repair of damage to finished Barge canal work by the flood of March last.

Contract No. 1.

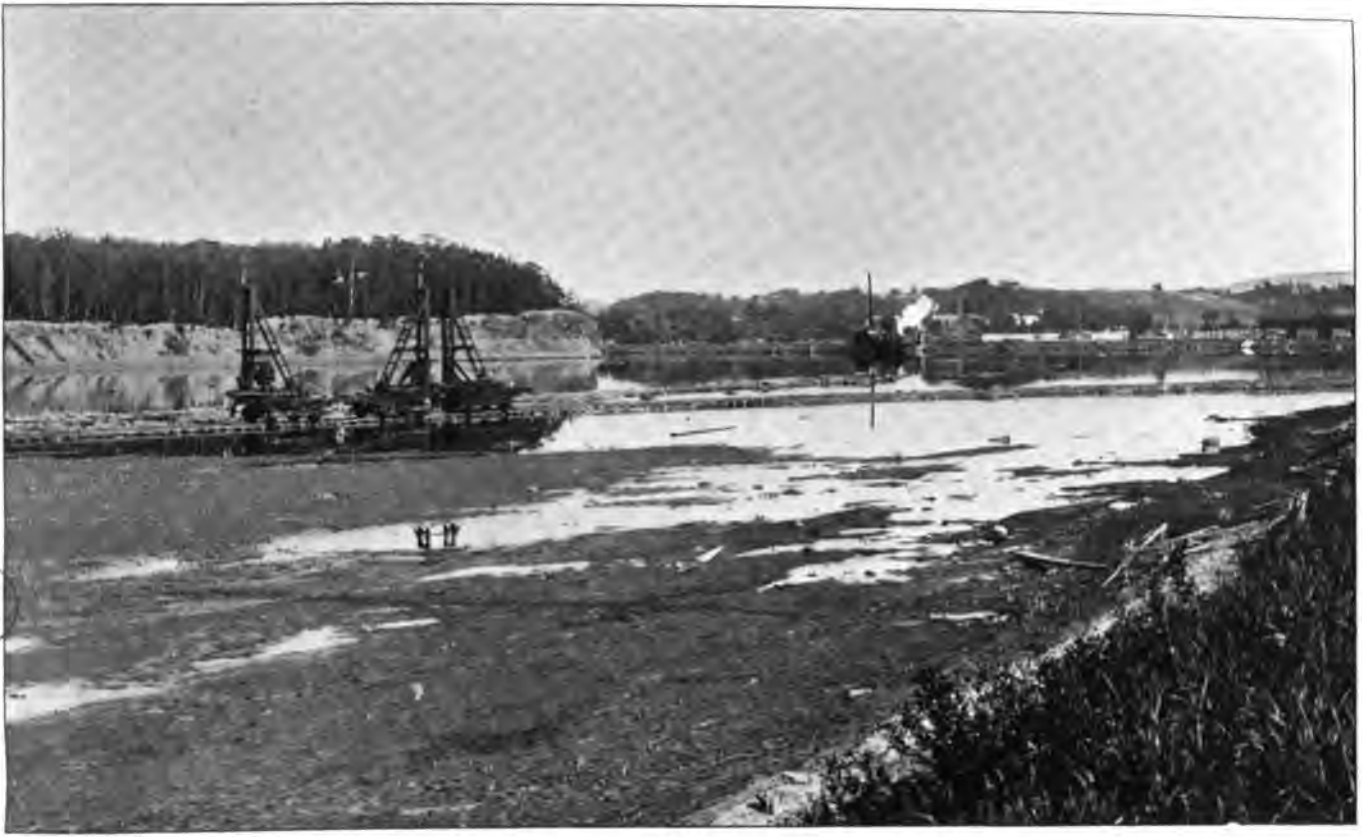
This contract provides for excavating the river channel from Northumberland to Fort Miller and from Crocker's Reef to Fort Edward; the construction of Crocker's Reef dam; the approaches to the head and foot of the "land line" and other incidental work. Length, 7.075 miles. E. W. Wendell, Assistant Engineer. Empire Engineering Corporation, contractor.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board August 28, 1907, permits spoil in river above Crocker's Reef dam to expedite work.

Alteration No. 3, approved by the Canal Board November 18, 1907, provides additional spoil areas to expedite work.

Alteration No. 2, approved by the Canal Board March 25, 1908, extends time, provides additional spoil areas in river to expedite work, and simplifies design of breakwater pier.



Barge Canal, Contract No. 72-A.

View showing unwatered coffer-dam in the Hudson river at Stillwater.

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Alteration No. 5, approved by the Canal Board July 21, 1908, widens channel below lock No. 6 to match work on contract No. 3.

Alteration No. 6, approved by the Canal Board June 24, 1909, eliminates work south of Sta. 23 + 85 to avoid damage to bridge; lowers tops of cribs below lock No. 6 to match work on contract No. 3.

No construction work has been done on this contract during the past year.

Contract No. 16 (*on Contract No.* 27-A).

This contract provides for furnishing and erecting in place steel highway bridge superstructures on contracts Nos. 11, 25 and 27. Raymond Jerrell, Rodman, in charge. The United Construction Company, contractor.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board September 1, 1908, lengthens spans of Fort Ann, Smith's Basin and George Henry bridges on account of flattened slopes.

Alteration No. 2, approved by the Canal Board June 8, 1911, changes plans for Comstock, Fort Ann, Brayton and George Henry bridges on contract No. 25 and bridge at Sta. 1240, contract No. 27, to conform to changes in canal slopes and substructures.

Alteration No. 3, approved by the Canal Board July 11, 1912, provides plate-girder approach span at east end of Comstock bridge to replace old span.

Alteration No. 4, approved by the Canal Board September 10, 1912, provides plate-girder approach spans at East street and Argyle street bridges to fit substructures built under contract No. 27-A.

During the winter of 1912–13 the East street truss span was moved to its new location, about 50 feet north of its former site. This work was done under an extra work order, dated August 14, 1912, at a cost of $1,943.75. Plank flooring was laid and hub guards and sidewalk railing placed on the main span. A plate girder approach span was placed at either end of the truss span, under alteration No. 4.

At the east end of the Argyle street truss span a plate girder approach was built complete under alteration No. 4.

Coping stone were set on the abutments and all items of work completed, finishing the contract on this section.

Final estimates have been completed.

The following is a summary of items on contract No. 16 (on contract No. 27-A) to September 30, 1913:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Structural steel . . . lbs.	995,250	71,960	970,624	7.2	97.5
Sawed lumber, yellow pine . . . ft. B. M.	99,000	6,607	82,843	6.5	83.9
Sidewalk railing . . . lin. ft.	254	70	254	27.5	100
Setting stone coping . . . cu. yds.	12	1.04	10.49	8.7	86.7
Lining . . . cu. yds.	12	0	0	0	0
Maintaining traffic . . . lump sum	$100	$100	$100	100	100

Contract No. 24.

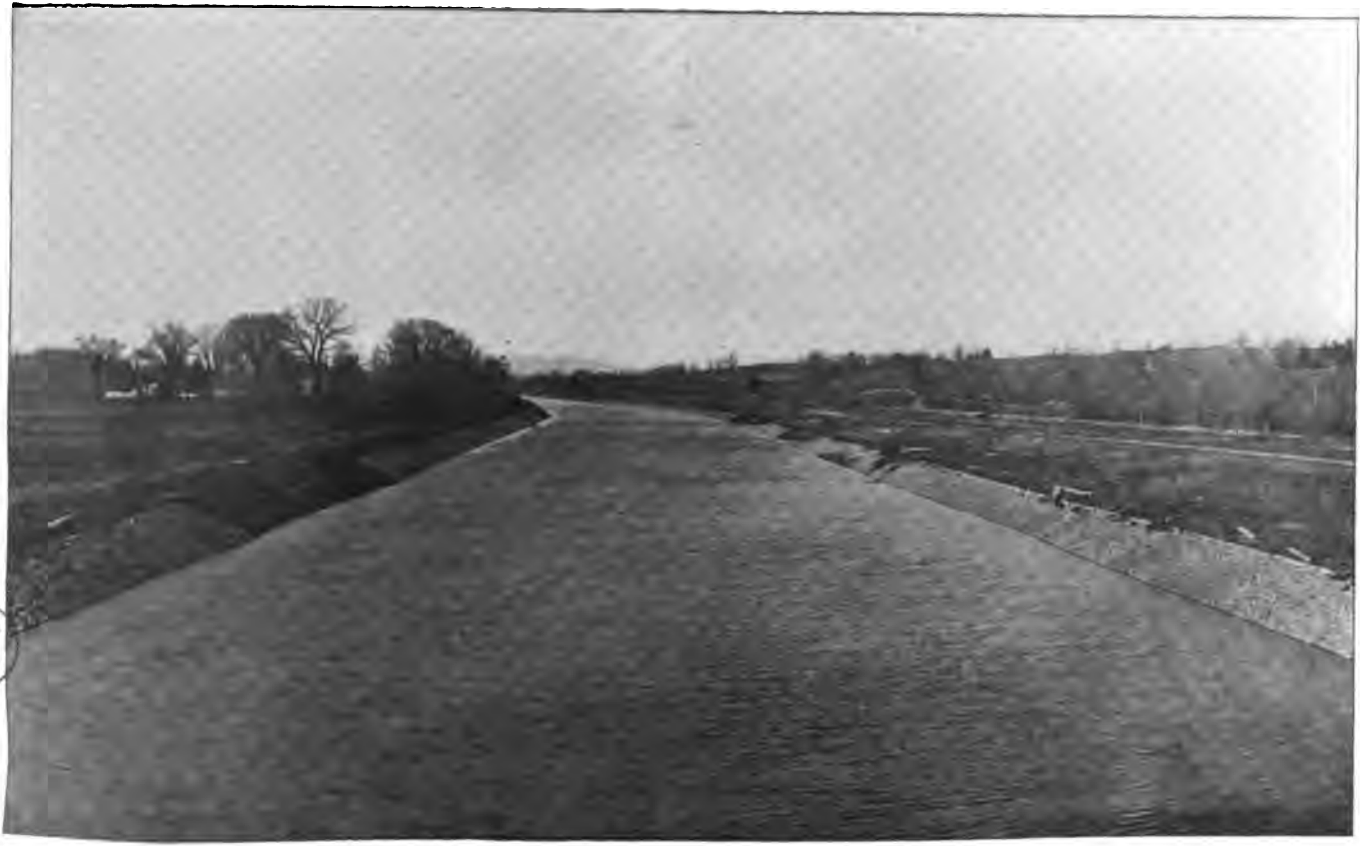
This contract provides for constructing a guard-gate at Crocker's Reef. Length, 0.19 mile. E. W. Wendell, Assistant Engineer, October 1, 1912, to July 31, 1913, and Raymond Jerrell, Rodman, in charge, August 1 to September 30, 1913. Kingsbury Construction Company, contractor.

This contract was awarded to James D. Sherrill, of Hudson Falls, N. Y., on November 1, 1911, and on June 3, 1912, it was assigned to the Kingsbury Construction Co., of Hudson Falls, N. Y.

During the fiscal year the following progress has been made: The pier supporting the west tower and sluice-gate walls has been finished. Sluice-gates and hoists have been placed and operated. All concrete has been completed, except counter-weights for the gates. The guard-gate and towers have been erected, but not painted. The installation of operating machinery has been commenced.

On March 27, 1912, the dike at the north end of this contract was washed out by the extraordinarily high water in the river, which removed the balance of the material remaining to be excavated, with the exception of a small amount of material above the guard-gate; also the embankment around the north end of the west wall and the wash wall protection.

Since the dike was washed out, the canal between Crocker's and Fort Miller has been filled to boating level, preventing the



BARGE CANAL, CONTRACT NO. 3.
View showing completed prism north of Payne's bridge, filled with water.

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grouting of the guide rails for the guard-gate, which will be done as soon as this level is coffer-dammed and the water drawn.

The following is a summary of items on contract No. 24 to September 30, 1913:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation .... cu. yds.	13,200	1,484	8,573	11.2	64.9
Forming embankment .... cu. yds.	2,640	635	1,276	24.1	48.3
White oak lumber .... ft. B. M.	500	464	464	92.8	92.8
Second-class concrete .... cu. yds.	1,784	617	1,996	34.6	111.9
Wash wall .... cu. yds.	2,630	244	1,923	9.3	73.1
Metal reinforcement .... lbs.	50	45	45	90	90
Metal in sluice-gates .... lbs.	11,000	8,893.8	8,893.8	80.8	80.8
Metal in guard-gate .... lbs.	199,000	159,876	159,876	80.3	80.3
Gate hoists .... No.	2	2	2	100	100

Contract No. 27-A.

This contract provides for completing the construction of the canal, together with all incidental work, between Sta. 1046 + 16, the south end of contract No. 25 at Dunham's Basin road, and the Hudson river at Fort Edward, Sta. 1245. Length, 3.76 miles. R. G. Gibson, Assistant Engineer. Holler & Shepard, contractors.

The work to be done under this contract includes the excavation of prism from lock No. 8 to the south end of the contract; leveling spoil banks; erection of guide walls to lock No. 8, together with substructure for the power house and lower guide walls to junction lock; abutments and piers for four Barge canal bridges; two plate girder bridges and abutments over Bond creek; one siphon spillway; two dive culverts; embankment with wash wall protection the entire length of the contract, and finishing concrete surfaces on lock No. 8.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board August 30, 1911, lowers foundation of west abutment of Argyle street bridge to obtain suitable foundations.

Alteration No. 2, approved by the Canal Board December 27, 1911, changes plans for power plant at lock No. 8 to conform to standard.

Alteration No. 3, approved by the Canal Board January 31, 1912, provides sheeting and bracing for dive culverts to decrease expense of excavation.

Alteration No. 4, approved by the Canal Board April 24, 1912, changes type of bridge floors to obtain better construction.

Alteration No. 5, approved by the Canal Board August 27, 1912, changes substructures of East street and Argyle street bridges to obtain suitable foundations; provides wooden sheet-piling at west embankment, Sta. 1177 to Sta. 1212 to prevent seepage.

Alteration No. 6, approved by the Canal Board December 11, 1912, provides for building a strut between the abutments of the Hudson Valley railway bridge to prevent sliding.

Alteration No. 7, approved by the Canal Board July 8, 1913, eliminates work provided by alteration No. 6.

During the year the excavation work has progressed in the prism, there still remaining some material to be excavated between the Argyle street bridge and the Hudson Valley railway bridge.

All the spoil banks have been leveled, except about 1,000 feet on the east side and 500 feet on the west side, north of Lock No. 8.

Embankment has been completed, except about 200 feet, along prism on west side from the north end of the contract to East street bridge.

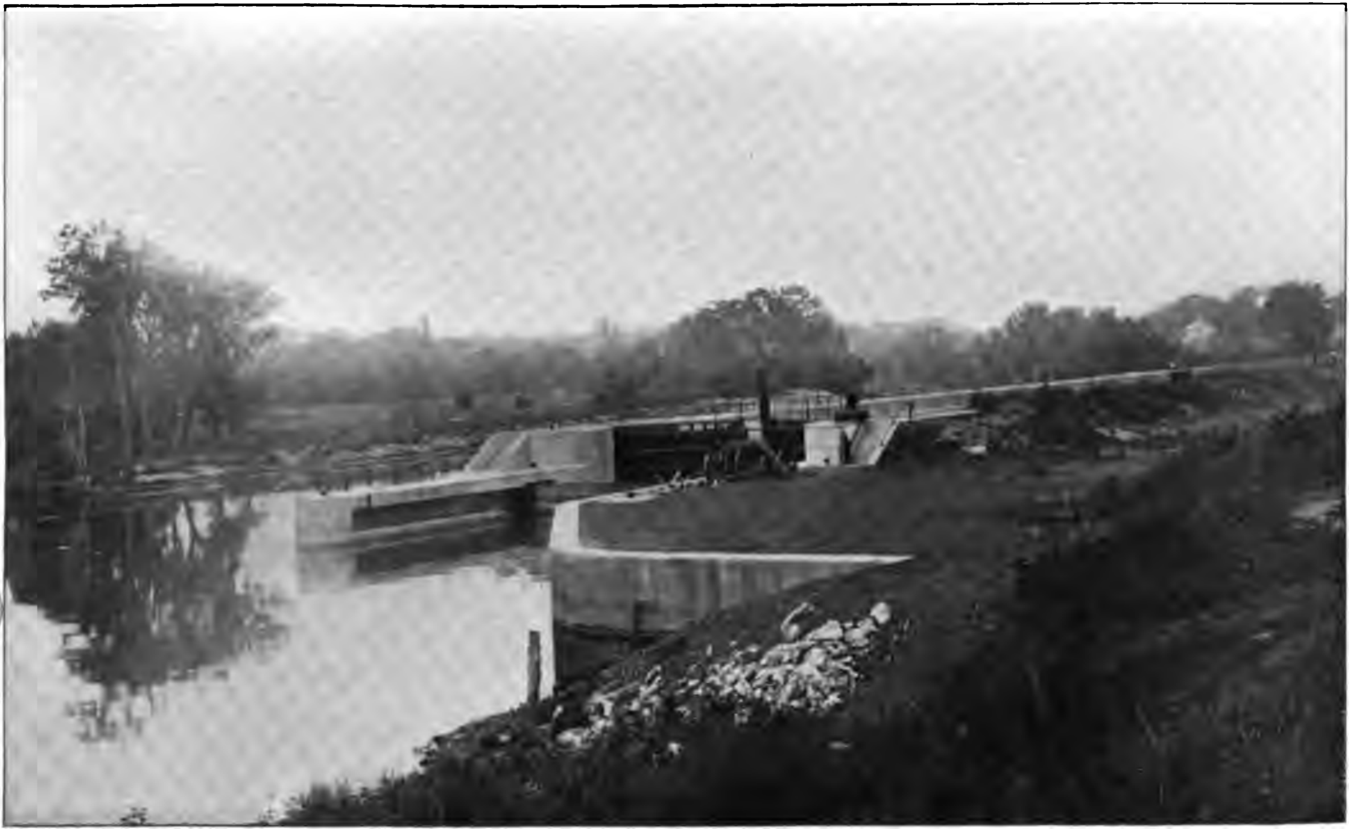
The approaches to East street and Broadway bridges are complete and the approach to Argyle street bridge is nearly finished.

Eighty-five thousand feet B. M. of triple-lap sheet-piles have been driven in the west berme between Stas. 1195 and 1205.

Concrete work has been completed for the new abutments and piers for East street bridge, one new abutment at Argyle street bridge, the new abutments at Argyle street bridge over old canal, the lower approach walls to junction lock, the siphon spillway at Argyle street, two dive culverts and sixteen isolated snubbing post bases back of the upper approach wall to lock No. 8.

Three thousand cu. yds. of wash wall stone have been placed on the slopes north of lock No. 8.

Wooden fencing has been built on approaches to three Barge canal bridges.



Barge Canal, Contract No. 54.
View showing the lower end of lock No. 7, at Fort Edward.

The principal items of work yet to be done are as follows: The southeast approach wall to lock No. 8; isolated snubbing posts on both sides of lower pool, lock No. 8, and along upper approach wall to lock No. 7; excavation to connect junction lock with Barge canal; completion of the embankment from Sta. 1212 to the south end of the contract, and finishing wash wall along the entire length of the contract.

The Hudson Valley Railway Company has built abutments and placed their bridge and approaches at lower Broadway, including a concrete floor across the bottom of the canal prism between abutments.

Under an extra work order, dated August 8, 1912, two cofferdams were built across the prism at Stas. 1170 and 1205, to maintain the water between these points at a sufficient height to prevent seepage from Bond creek washing out the gravelly banks.

An extra work order, date of August 8, 1912, authorized the removal of the concrete slab abutments and piers at East street bridge, which were wrecked in a slide of the east bank, and under this same order the east abutment and piers at Argyle street bridge were removed.

Under an extra work order, dated November 2, 1912, steel sheet-piling was placed across the upper end of lock No. 7, to prevent water from the river interfering with the excavation of the prism near lower Broadway.

Under an extra work order, dated March 22, 1913, 300 linear feet of steel sheet-piling were driven in the present tow-path across the prism at lower Broadway.

The following is a summary of items on contract No. 27-A, as affected by alterations Nos. 1, 2, 3, 4, 5, 6 and 7, to September 30, 1913:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... lump sum	1	0	65.7%	0	65.7
Grubbing .... cu. yds.	*8,350	294	4,684	3.5	56.1
Excavation from spoil banks .... cu. yds.	182,000	49,594	171,305	27.2	94.1
All other excavation .... cu. yds.	353,980	106,290	199,491	30	56.3
Sheeting and bracing .... ft. B. M.	†240,000	152,185	231,085	63.4	96.3
Forming embankment .... cu. yds.	152,310	39,545	99,991	25.9	65.6

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* Increased from 1,350 cu. yds. to 8,350 cu. yds. by resolution of Canal Board, August 30, 1911.

† Increased by 50,000 ft. B. M., by resolution of Canal Board, March 20, 1912.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Gravel lining........cu. yds.	3,870	1,789	1,789	46.2	46.2
Sawed lumber........ft. B. M.	34,000	13,844	29,484	40.7	86.7
Yellow pine in lock-gates........ft. B. M.	7,000	0	6,440	0	92
White oak........ft. B. M.	300	0	180	0	60
Foundation piles, 15 ft. long........No.	860	0	509	0	59.2
Foundation piles, 20 ft. long........No.	1,050	407	962	38.8	91.6
Sheet-piling........ft. B. M.	489,750	85,429	159,529	17.5	32.6
Second-class concrete........cu. yds.	14,470	3,979	13,903	27.5	96.1
Reinforced concrete........cu. yds.	1,072	44	1,018	4.2	95
Finishing concrete surfaces........sq. ft.	10,000	1,086	1,146	10.9	11.5
Masonry bridge coping........cu. yds.	14	0	12	0	85.7
Wash wall........cu. yds.	27,360	2,808	12,175	10.3	44.5
Second-class stone paving........sq. yds.	714	107	158	15	22.1
Third-class riprap........cu. yds.	510	76	76	14.9	14.9
15-inch vitrified pipe........lin. ft.	40	0	0	0	0
Structural steel........lbs.	188,200	192	163,146	0.1	86.7
Metal reinforcement........lbs.	69,650	8,665	66,834	12.5	96
Cast iron pipe........lbs.	225,200	218,755	218,755	97.1	97.1
Iron castings........lbs.	40,600	7,988	12,981	19.7	32
Wooden pavement........sq. yds.	0	0	0	0	0
Wooden fencing........lin. ft.	5,160	4,205	4,205	81.5	81.5
Lattice railing........lin. ft.	265	0	242	0	91.3
Removing three old bridge superstructures, lump sum	1	0	0	0	0
Maintaining traffic........lump sum	1	42%	80%	42	80
Sluice-gate........lump sum	1	90%	90%	90	90
Lowering Argyle street bridge......lump sum	1	0	0	0	0
Maintaining traffic over Bond creek.lump sum	1	46.67%	100%	46.67	100
Foundation piles........lin. ft.	10,500	10,170	10,170	96.9	96.9

Contract No. 54.

This contract provides for constructing lock No. 7, at Fort Edward. Length, 0.22 mile. C. A. Curtis, Assistant Engineer, from October 1, 1912, to April 15, 1913, and Byron Houghtaling, Rodman, in charge, from April 16 to August 16, 1913. Hunkin-Conkey Construction Company, contractor.

This contract has been modified by alterations as follows:

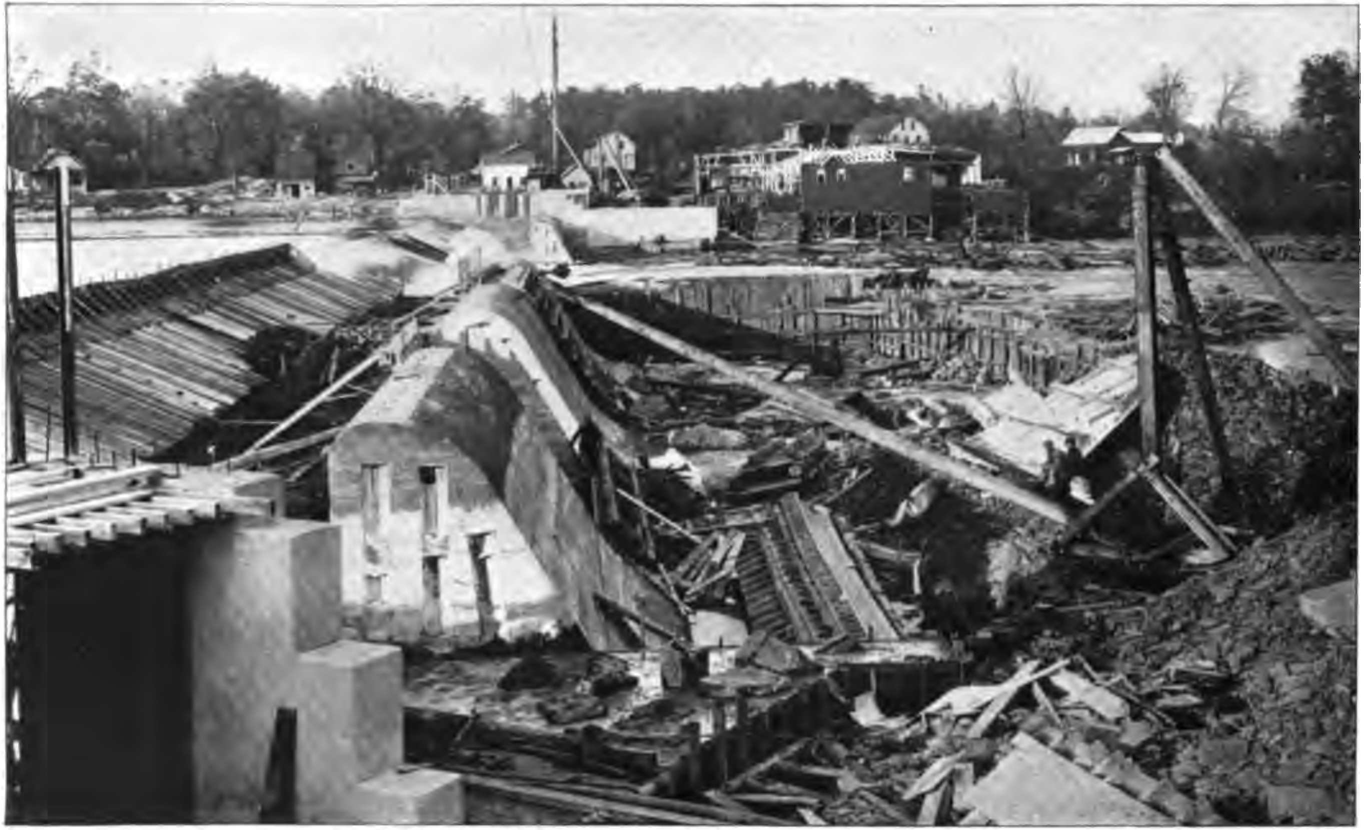
Alteration No. 1, approved by the Canal Board October 25, 1910, changes specifications for coffer-dams, etc., to provide partial payments as sections of work are completed.

Alteration No. 2, approved by the Canal Board September 10, 1912, provides concrete lining in bottom of canal below lock No. 7 in place of riprap to insure against scour.

The last concrete was placed in the lock in November, 1912.

Borrow excavation was taken from the adjoining contract (No. 27-A) to complete the embankment back of the east lock wall, which was completed in January, 1913.

All excavation was completed in May.



BARGE CANAL, CONTRACT No. 56.
View showing progress made in constructing the feeder dam across the Hudson river at Glens Falls.

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From May until August a small force was finishing concrete, leveling embankments, trimming slopes and removing plant and rubbish from the contract site.

Construction work was reported finished on August 16, and contract accepted by Canal Board.

The following is a summary of items on contract No. 54, as affected by alterations Nos. 1 and 2:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation . . . . . cu. yds.	45,600	12,987	42,930	28.5	94.1
Sheeting and bracing [a] . . . . . ft. B. M.	14,000	0	9,335	0	66.6
Forming embankment . . . . . cu. yds.	11,300	0	8,851	0	78.3
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	1,100	560	560	51	51
Sawed lumber in needles . . . . . ft. B. M.	16,000	18,317	*18,317	114.4	114.4
White oak lumber in miter-sills, lock-gates and buffer-blocks . . . . . ft. B. M.	6,800	2,927	*7,807	43	114.8
Foundation piles, 16 ft. to 30 ft. long . . . lin. ft.	60,690	0	53,244	0	87.8
Mooring piles, 20 ft. long . . . . . lin. ft.	130	120	120	92	92
Wooden sheet-piling . . . . . ft. B. M.	225,000	0	†247,068	0	109.8
Second-class concrete [b] . . . . . cu. yds.	21,925	639	19,961	3	91
Wash wall . . . . . cu. yds.	600	531.2	531.2	88.6	88.6
Second-class riprap [c] . . . . . cu. yds.	240	0	0	0	0
Third-class riprap . . . . . cu. yds.	3,660	1,482	3,624	40.5	99
Structural steel . . . . . lbs.	7,200	947	7,051	13.2	97.9
Metal reinforcement . . . . . lbs.	376,000	0	8,111	0	2
Steel castings . . . . . lbs.	9,800	4,890	8,802	49.9	89.8
Iron castings, machined . . . . . lbs.	7,300	0	6,524	0	89.4
Wrought iron pipe, 3-inch diameter . . . . lin. ft.	250	0	238	0	95.2
Wrought iron pipe railing . . . . . lin. ft.	480	458	458	95.4	95.4
Metal in lock-gates . . . . . lbs.	200,000	72,704	190,472	36.3	95.3
Metal in buffer-beams . . . . . lbs.	92,000	17,638	86,998	19 2	94.6
Metal in lock-valves . . . . . lbs.	25,000	1,163	23,250	4.6	93
Coffer-dams, pumping, bailing and draining, lump sum	$18,000	$6,000	$18,000	33.3	100

* Increase made in accordance with general order No. 43, issued January 2, 1913.

† Longer lengths necessary than called for in preliminary estimate.

[a] Amount of sheeting and bracing increased from 2,000 ft. B. M. to 14,000 ft. B. M. by resolution of Canal Board, dated April 6, 1911.

[b] Amount of second-class concrete increased from 21,700 cu. yds. to 21,925 cu. yds. by resolution of Canal Board, dated September 10, 1912.

[c] Second-class riprap eliminated from contract by resolution of Canal Board, dated September 10, 1912.

Contract No. 56.

This contract provides for improving the Glens Falls feeder. W. C. Benedict, Assistant Engineer. Flood & Van Wirt Company, contractor. The contract was signed on September 26, 1912, and work began on October 14, 1912.

The improvement contemplates increasing the flow through the feeder canal, necessitated by the greater volume of water required for the Barge canal. This increased capacity is secured by raising the banks of the feeder one foot, removing the high parts in the bottom, stopping leaks in the prism, replacing the old feeder dam with a new concrete dam about one foot higher and enlarging the by-passes at the locks.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board March 19, 1913, provides for various changes at bridges, locks, by-passes, etc., on account of poor condition of old structures.

Alteration No. 2, approved by the Canal Board August 19, 1913, changes grade of approaches to bridge No. 13,— betters conditions at slight increase in cost.

At the feeder dam, where the water is diverted from the Hudson river into the feeder, a new concrete spillway with bulkhead gates at each end is being built immediately below the old timber crib dam and it is now more than half completed. The spillway of this dam is 615 feet in length. On each end is a bulkhead with gates to supply water for power rights owned by corporations, and until this year was used by them for mill purposes.

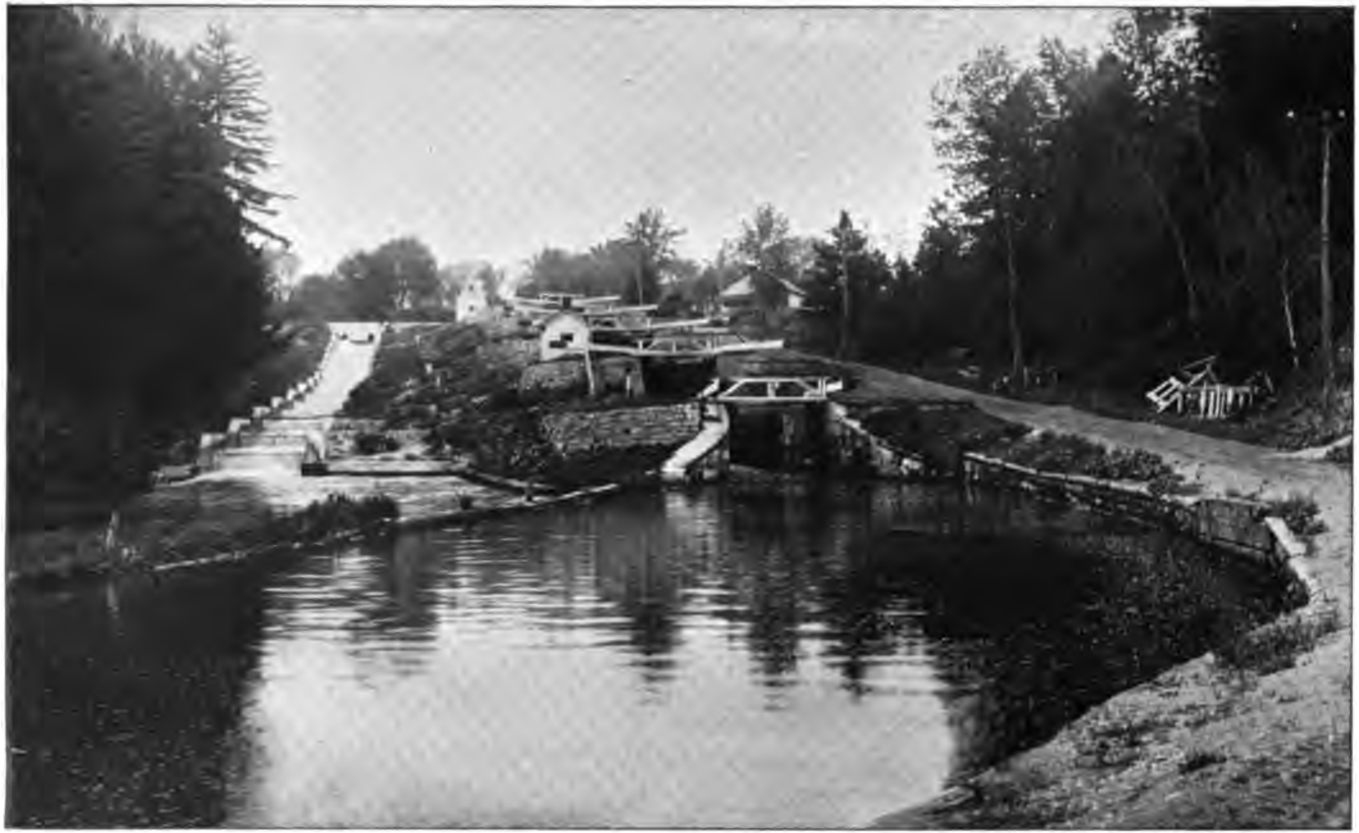
During the past winter (1912–13) new concrete by-passes were built at the thirteen locks, controlled by head-walls provided with four valves and a siphon installed at each of the by-passes, the latter to automatically regulate the ordinary flow of water.

The permanent connection between the Champlain canal and the Barge canal near Dunhams Basin was completed, with the exception of the removal of the present spillway gates in the old canal. This work includes a retention dam in Bond creek and a sill across the channel of the ditch at the junction with the new canal.

The bottom of the feeder canal has been brought to grade, with the exception of about one mile between Glens Falls and feeder dam. The banks of the canal have been raised, where required, for about one-half its length.

To provide the 11-foot clearance above new water-surface in the canal, ten of the bridges have been raised by placing concrete caps on the old abutments, or by the building of new abutments. Two bridges were replaced by new superstructures on new abutments.

At the end of the fiscal year the contract is 60 per cent completed.



Barge Canal, Contract No. 56.

View showing locks Nos. 6 to 10, inclusive, on the Glens Falls feeder with new by-pass (at the left), which is completed.

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The following is a summary of items on contract No. 56, as affected by alterations Nos. 1 and 2:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation . . . . cu. yds.	109,760	66,216	66,261	60.3	60.3
Removing old masonry . . . . cu. yds.	2,930	3,316	3,316	113.2	113.2
Sheeting and bracing . . . . ft. B. M.	41,000	13,922	13,922	33.9	33.9
Forming embankment . . . . cu. yds.	32,280	18,238	18,238	56.4	56.4
Lining . . . . cu. yds.	13,860	7,526	7,526	54.3	54.3
Puddle . . . . cu. yds.	100	66	66	66	66
Sawed lumber, yellow pine . . . . ft. B. M.	118,000	44,455	44,455	37.6	37 6
Sawed lumber, white oak . . . . ft. B. M.	2,300	572	572	24.8	24.8
Foundation piles . . . . lin. ft.	1,790	1,903	1,903	106.3	106.3
Wooden sheet-piling . . . . ft. B. M.	150,000	109,272	109,272	72.8	72.8
Second-class concrete . . . . cu. yds.	22,670	14,169	14,169	62.5	62.5
Reinforced concrete . . . . cu. yds.	132	125	125	94.6	94.6
First-class masonry bridge coping . . . . . cu. yds.	8	6	6	75	75
Second-class stone paving . . . . sq. yds.	1,790	1,722	1,722	96.2	96.2
Structural steel . . . . lbs.	123,700	54,943	54,943	44.4	44.4
Metal reinforcement . . . . lbs.	104,900	95,752	95,752	91.2	91 2
Bronse . . . . lbs.	4,900	1,523	1,523	31	31
Iron castings, plain . . . . lbs.	35,800	19,296	19,296	53.8	53.8
Portland cement sidewalks . . . . sq. yds.	56	0	0	0	0
Relaying sidewalks . . . . sq. yds.	40	33	33	82.5	82.5
Cobblestone paving relaid . . . . sq. yds.	20	0	0	0	0
Brick pavement . . . . sq. yds.	410	0	0	0	0
Wooden fence . . . . lin. ft.	3,990	3,037	3,037	76.1	76.1
24-in. x 36-in. sluice-gates, complete in place, No.	36	32	32	88.8	88.8
Wrought iron pipe railing . . . . lin. ft.	90	0	0	0	0
Wrought iron pipe railing reset . . . . lin. ft.	90	0	0	0	0
Gate hoists, class " A " . . . . No.	4	0	0	0	0
Gate hoists, class " B " . . . . No.	8	0	0	0	0
Metal in Taintor gates . . . . lbs.	17,000	0	0	0	0
Raising bridges . . . . No.	14	12	12	85.7	85.7
Coffer-dams, pumping, bailing and draining. lump sum	$10,000	$6,000	$6,000	60	60
Round timber docking . . . . lin. ft.	13,500	4,395	4,395	32.5	32.5
Dry rubble masonry walls . . . . cu. yds.	720	259	259	35.9	35.9
Wood block pavement . . . . sq. yds.	210	202	202	96	96
Removing and reërecting Dunhams Basin bridge . . . . lump sum	$950	0	0	0	0
Additional cost for maintaining traffic of bridges Nos. 2 and 11 . . . . No.	2	2	2	100	100

CHAMPLAIN CANAL, RESIDENCY NO. 3.

Resident Engineer E. V. R. Payne reports:

Residency No. 3, Champlain canal, extends from the highway bridge at Dunhams Basin, Washington county, northerly to Lake Champlain at Whitehall, a distance of 19.8 miles.

The following contracts are located within this residency: Nos. 15 and 25 and portions of Nos. 16, 32, 33 and 90.

Contracts Nos. 15, 32, 33 and 90 were completed prior to October 1, 1912, and contracts Nos. 16 and 25 were finished during the present year.

Work Done.

The Atlantic, Gulf & Pacific Company excavated guard-lock hill slope under a special agreement with the Department of Public Works and under supervision of this office.

Other work has consisted of compiling data for reports on claims and completing final estimate for contract No. 25.

Contract No. 16 (*on Contract No.* 25).

This contract provides for furnishing and erecting in place steel highway bridge superstructures on contracts Nos. 11, 25 and 27. Raymond Jerrell, Rodman, in charge. The United Construction Company, contractor.

A list of alterations on this contract is given in the report of Residency No. 2.

At the east end of the truss span of Comstock bridge a plate girder approach span was built complete under alteration No. 3. The temporary bridge built by the Atlantic, Gulf & Pacific Company was removed, coping stone set and bridge painted, thus completing the contract.

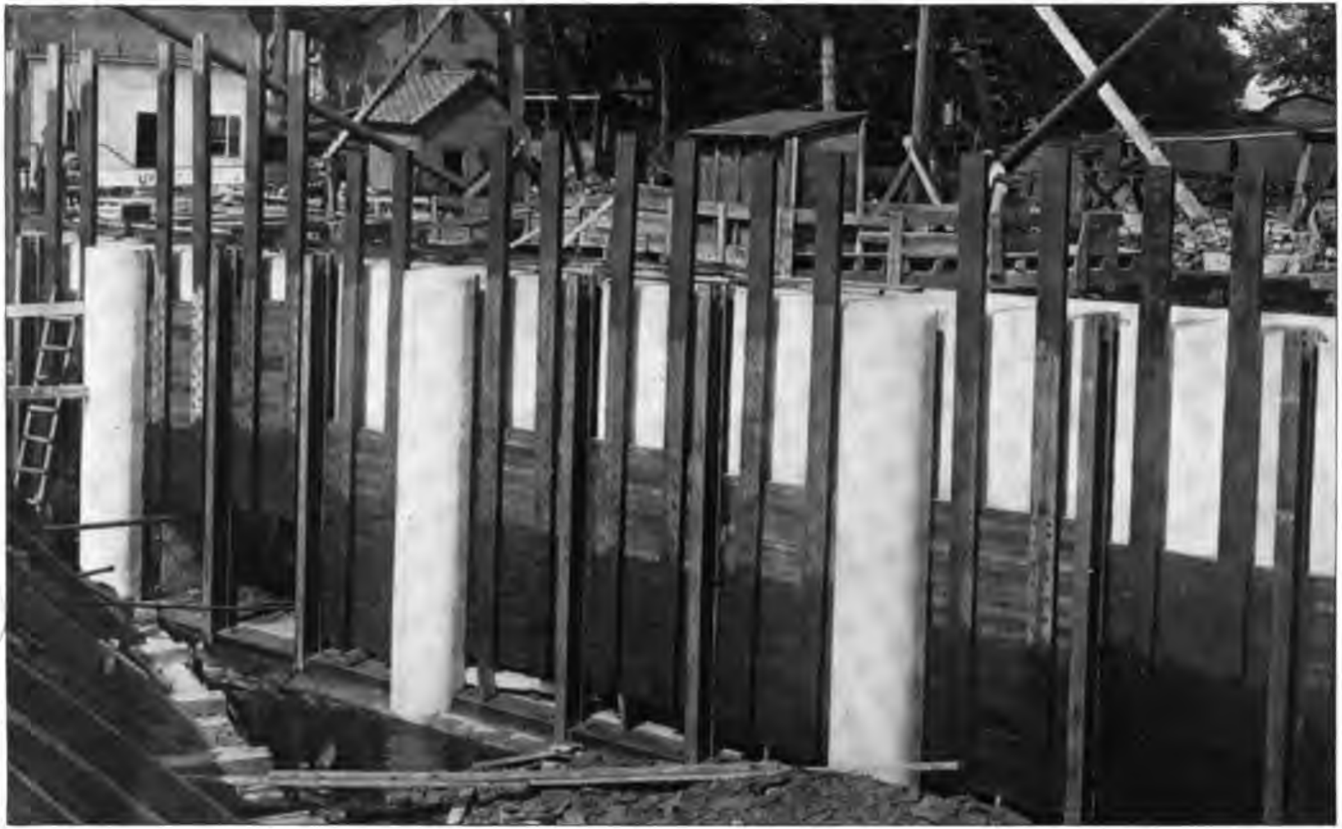
Final estimates have been prepared.

The following is a summary of items on contract No. 16 to September 30, 1913:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Structural steel . . . . lbs.	819,500	190,528	761,521	23.2	92.8
Yellow pine sawed lumber . . . . . . ft. B. M.	78,300	34,633	75,766	44.3	96.8
Sidewalk railing . . . . lin. ft.	598	337.5	520.5	57.5	88.7
Setting stone coping . . . . cu. yds.	8.2	5.12	8.12	6.24	99
Lining . . . . cu. yds.	8	0	2	0	25

Contract No. 25.

This contract provides for excavating the canal and protecting its sides, constructing lock No. 9 and necessary spillways, power plants and appertaining structures, bridge substructures and approaches, retaining walls, highways, and other incidental details between Sta. 356, about 0.6 mile north of Comstock post-office, and Sta. 1041 + 54, at Dunhams Basin road, Washington



BARGE CANAL, CONTRACT NO. 56.
View showing type of head gates being constructed in connection with the feeder dam at Glens Falls.

county. Length of contract, 13 miles. W. B. Watson, Assistant Engineer. Atlantic, Gulf & Pacific Company, contractor.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board January 29, 1908, provides one lock in place of two to decrease expense; flattens slopes and eliminates wash wall, because of soft material; extends time on account of changed plans.

Alteration No. 2, approved by the Canal Board April 14, 1909, flattens slopes and eliminates wash wall, because of soft material; eliminates embankments in front of spoil banks, changes location of bridge at Comstock to improve alignment; provides drainage culvert under road at Sta. 386 + 62; eliminates channeling on account of hard rock, substitutes line drilling; substitutes rubble for concrete walls at rock cut; substitutes pile docking for concrete walls below lock No. 9, because of soft foundation; provides pile foundations at bridge abutments; changes details of lock construction, gates, etc., to conform to standard.

Alteration No. 3, approved by the Canal Board October 22, 1909, changes plans for abutments and approaches for highway bridges, etc., for better construction.

Alteration No. 4, approved by the Canal Board February 15, 1910, provides foundation for power house at lock No. 9 to avoid future excavation.

Alteration No. 5, approved by the Canal Board May 18, 1910, eliminates concrete wall adjacent to railroad, Sta. 530 to Sta. 537, as being unnecessary; provides cinder fill at Comstock bridge to reduce pressure on abutment; provides for dressing walls of old lock No. 18 to accommodate traffic at lower water level.

Alteration No. 7, approved by the Canal Board September 29, 1910, changes plans for abutments, etc., at Brayton's and George Henry bridges, because of soft foundations.

Alteration No. 8, approved by the Canal Board December 29, 1910, changes plans of substructure at Fort Ann bridge on account of soft foundation, and of Comstock bridge to provide for maintaining old canal.

Alteration No. 9, approved by the Canal Board July 11, 1912, changes details of bank construction near lock No. 9 to improve conditions; raises highway, Sta. 416 + to Sta. 427, to avoid flooding; changes east abutment and approach of Comstock bridge to secure a better structure on account of new prison.

Alteration No. 10, approved by the Canal Board July 18, 1912, provides basin in canal at Comstock for harbor.

The rock cuts at Stas. 512 and 526, at Battle hill, were finished during October, November and December.

The highway bridge abutment to approach span at Comstock was also finished.

The balance of wash wall was laid.

The highway for a distance of about 1,200 feet north from wooden lock was raised and covered with lining and wash wall protection to the canal side of road-bed was placed.

Spoil banks were leveled in places and plant removed during the year.

Fender bolts were made and piled at Comstock for the protection of boats the entire length of Flat rock and Battle hill rock cuts.

The contract was accepted by the Canal Board on December 18, 1912.

The following is a summary of items on contract No. 25, as affected by alterations Nos. 1, 2, 3, 4, 5, 7, 8, 9 and 10, to September 30, 1913:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... acres	65 69	0	65.69	0	100
Grubbing .... cu. yds.	36,600	0	9,435	0	25.8
All excavation .... cu. yds.	5,621,300	23,210	5,070,718	0.4	90.2
Embankment .... cu. yds.	156,795	1,718	112,789	1 1	71.9
Lining .... cu. yds.	14,563	727	12,598	4.9	86.5
Sheeting and bracing .... ft. B. M.	104,700	8,948	70,805	8.5	67.6
Sawed lumber, hemlock .... ft. B. M.	2,800	0	2,570	0	91.8
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	151,800	0	145,943	0	96.1
White oak in miter-sills .... ft. B. M.	1,700	0	1,586	0	93.3
Piling .... No.	2,766	0	2,756	0	100
Sheet-piling .... ft. B. M.	1,249,000	0	1,022,066	0	81.8
Stone-coping, first-class .... cu. yds.	15	0	10	0	67
Concrete, all classes .... cu. yds.	27,884	633	27,567	2.3	98
Wash wall .... cu. yds.	53,515	897	52,709	1.7	98.5
Riprap, all classes .... cu. yds.	6,245	53	3,838	0.8	61.5
Paving, second-class .... sq. yds.	3,097	0	1,832	0	59.1
Ballast .... cu. yds.	338	0	134	0	40
Iron castings, plain .... lbs.	25,950	0	25,262	0	97.3
Iron castings, machined .... lbs.	20,000	0	19,068	0	95.3
Metal reinforcement .... lbs.	68,395	0	66,571	0	97.3
Structural steel .... lbs.	58,780	0	39,498	0	67.2

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Wrought iron pipe railing .... lin. ft.	310	0	243	0	78.4
Wooden fence .... lin. ft.	5,640	1,159	4,574	20.5	81.1
Removing superstructures .... lump sum	$600	0	$600	0	100
Fender fastenings .... lbs.	283	0	274	0	97
Dry rubble masonry .... cu. yds.	3,010	0	298	0	9.9
Moving temporary bridge .... lump sum	$800	0	$800	0	100
Cinder filling .... cu. yds.	2,020	0	1,660	0	82
Dressing face of walls, old lock No. 18, lump sum	$350	0	$350	0	100
Gross estimate	$1,707,191	$13,302.83	$1,538,869.83	0.8	90.2

THE FOLLOWING STATEMENTS SHOW THE NAMES, RANK AND COMPENSATION OF ENGINEERS EMPLOYED IN THE EASTERN DIVISION OF THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES, FOR THE FISCAL YEAR ENDED SEPTEMBER 30, 1913.

Ordinary Repairs to Canals — Erie Canal.

Chapter 546, Laws of 1912.

NAME.	Rank.	Rate of compensation	Services.	Travel.	Total.
D. B. La Du	Division engineer	$400 per month	$3,450 00	....	$3,450 00
R. G. Finch	Assistant engineer	7 00 per day	175 00	....	175 00
H. J. O'Hara	Leveler	4 50 per day	202 50	....	202 50
W. L. Collins	Stenographer	100 per month	400 00	....	400 00
Hattie A. Dell	Stenographer	100 per month	500 00	....	500 00
C. D. Burrus	Engineering draftsman	6 00 per day	156 00	....	156 00
C. T. Kniskern, Jr	Tracer	83 33 per month	333 32	....	333 32
			$5,216 82	....	$5,216 82
Incidental Expenses.					
Fuel and light				$348 80	
Stationery and printing				7 61	
Postage				57 11	
Telephone and telegraph				1,840 20	
Miscellaneous				448 53	
					2,702 25
Total					$7,919 07

Ordinary Repairs to Canals — Champlain Canal.

Chapter 546, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. B. La Du	Division engineer	$350 per month	$1,050 00	....	$1,050 00
John F. Mitchell	Cashier	150 per month	208 06	....	203 06
Hattie A. Dell	Stenographer	100 per month	700 00	....	700 00
W. L. Collins	Stenographer	100 per month	300 00	....	300 00
C. D. Burrus	Engineering draftsman	6 00 per day	84 00	....	84 00
C. T. Kniskern, Jr	Tracer	83 33 per month	333 32	....	333 32
			$2,675 38	....	$2,675 38
Incidental Expenses.					
Fuel and light				$279 10	
Stationery and printing				2 00	
Postage				78 00	
Telephone and telegraph				553 28	
Miscellaneous				493 17	
					1,405 55
Total					$4,080 93

Construction of Barge Canal — Head Office Account.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Alex. E. Kastl	Special deputy state engineer	$500 per month	$6,000 00	$593 73	$6,593 73
H. D. Alexander	Special resident engineer	400 per month	4,599 99	178 38	4,778 37
R. S. Greenman	Resident engineer	250 per month	3,000 00	2,559 21	5,559 21
C. H. MacCulloch	Resident engineer	250 per month	3,000 00		3,000 00
H. D. Miller	Resident engineer	250 per month	2,958 33		2,958 33
W. B. Watson	Resident engineer	225 per month	2,250 00	39 32	2,289 32
H. A. Weeks	Resident engineer	250 per month	2,047 00	17 42	2,064 42
N. E. Whitford	Resident engineer	250 per month	3,000 00	18 87	3,018 87
M. G. Barnes	Consulting engineer	60 00 per day	7,140 00	730 97	7,870 97
Wm. H. Burr	Consulting engineer	60 00 per day	5,220 00	655 53	5,875 53
G. S. Greene, Jr	Consulting engineer	60 00 per day	5,160 00	719 68	5,879 68
Joseph Ripley	Consulting engineer	600 per month	7,200 00	682 71	7,882 71
T. K. Thomson	Consulting engineer	60 00 per day	5,721 00	838 36	6,559 36
A. W. Conner	Civil engineer of grade crossings	176 per month	2,049 55	17 26	2,066 81
C. C. Egbert	Expert on electrical design	20 00 per day	810 00		810 00
G. F. Stickney	Expert lock designer and supervising engineer	416 66 per month	3,333 33	232 98	3,566 31
R. G. Finch	Supervising engineer	300 per month	48 39	58 70	107 09
R. E. Phillips	Supervising engineer	300 per month	2,684 00	496 02	3,180 02
W. H. Yates	Supervising engineer	400 per month	2,319 35	214 43	2,533 78
Isaiah Abrahams	Bridge designer	150 per month	464 52		464 52
J. M. Angus	Bridge designer	150 per month	1,470 51		1,470 51
Henry Auerbach	Bridge designer	150 per month	1,681 99		1,681 99
Alexander Asrikan	Bridge designer	1,501 per year	193 67		193 67
J. L. Bradford	Bridge designer	175 per month	1,770 32		1,770 32
E. A. Brainerd	Bridge designer	200 per month	2,400 00		2,400 00
H. E. Brainard	Bridge designer	200 per month	600 00	61 28	661 28
S. Cohen	Bridge designer	150 per month	1,207 50		1,207 50
Horace Corbin	Bridge designer	150 per month	1,562 91		1,562 91
J. C. Green,	Bridge designer	175 per month	2,100 00		2,100 00
A. G. Hayden	Bridge designer	200 per month	2,400 00		2,400 00
F. A. Hermans,	Bridge designer	150 per month	931 77		931 77
W. S. McDowell	Bridge designer	175 per month	1,499 25	1 30	1,500 55
Percy J. Peters	Bridge designer	150 per month	474 19		474 19
J. M. C. Quarles de Quarles	Bridge designer	200 per month	2,380 65		2,380 65
C. E. Quimby	Bridge designer	150 per month	1,470 51		1,470 51
H. J. Scheuermann	Bridge designer	175 per month	2,100 00	64 79	2,164 79
E. G. Semon	Bridge designer	150 per month	841 94		841 94
W. M. Smelo	Bridge designer	150 per month	1,510 83		1,510 83
J. E. Tonnelier	Bridge designer	150 per month	1,122 58		1,122 58
L. C. West	Bridge designer	150 per month	1,154 03		1,154 03
C. H. Wood	Bridge designer	200 per month	2,400 00		2,400 00
J. F. Blaise	Bridge draftsman	125 per month	1,407 26		1,407 26
A. C. Miller	Bridge draftsman	100 per month	607 47		607 47
A. Bluestone	Junior bridge draftsman	100 per month	750 00		750 00
E. E. Briggs	Junior bridge draftsman	100 per month	1,200 00		1,200 00
A. E. Green	Junior bridge draftsman	100 per month	781 02		781 02
Israel Orlian	Junior bridge draftsman	75 per month	132 50		132 50
W. A. White	Junior bridge draftsman	75 per month	142 74		142 74
F. R. Clair	Auditor and financial clerk	333 33 per month	3,333 33	581 13	3,914 46
Thos. Hassett	Confidential assistant	333 33 per month	2,333 31	226 09	2,559 40
J. F. Mitchell	Cashier	150 per month	450 00	25 01	475 01
Hugh Reilly	Cashier	150 per month	728 23		728 23
John J. Allen	Canal clerk	150 per month	1,800 00		1,800 00
C. B. Dunham, Jr	Clerk	150 per month	1,800 00		1,800 00
J. T. Gorman	Clerk	125 per month	1,500 00	129 23	1,629 23
J. C. Guffin	Clerk	125 per month	1,500 00		1,500 00
J. E. F. Minnock	Clerk	125 per month	1,500 00		1,500 00
G. T. Waterman	Clerk	100 per month	1,200 00		1,200 00
Nelle Clark	Stenograhper	100 per month	1,200 00	96 55	1,296 55
W. L. Collins	Stenographer	100 per month	500 00	26 08	526 08
Agnes Fogarty	Stenographer	75 per month	720 00		720 00
Adele Hallenbeck	Stenographer	100 per month	925 81		925 81
Mary G. Harrington	Stenographer	100 per month	1,200 00		1,200 00
Grace Haswell	Stenographer	100 per month	1,200 00		1,200 00
S. C. MacNeil	Stenographer	100 per month	1,200 00		1,200 00
J. J. Tobin	Stenographer	125 per month	1,500 00		1,500 00
Cleora Van Vleck	Stenographer	100 per month	1,200 00		1,200 00
Anna M. Weber	Stenographer	90 per month	930 00		930 00
R. B. Allen	Engineering draftsman	4 00 per day	284 00		284 00
C. D. Burrus	Engineering draftsman	6 00 per day	1,482 00		1,482 00

Construction of Barge Canal — Head Office Account — (Continued)

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
H. L. Clarke	Engineering draftsman	$5 00 per day	$495 00		$495 00
J. A. Galvin	Engineering draftsman	5 00 per day	210 00		210 00
C. A. Huhne	Engineering draftsman	4 00 per day	834 00		834 00
J. H. McCormick, Jr	Engineering draftsman	5 00 per day	515 00		515 00
G. D. Meer	Engineering draftsman	5 00 per day	1,565 00		1,565 00
Chas. Messina	Engineering draftsman	4 00 per day	892 00		892 00
W. J. Picard	Engineering draftsman	5 00 per day	1,565 00	$8 42	1,573 42
G. L. Schillner	Engineering draftsman	5 00 per day	1,490 00		1,490 00
S. T. Vosburgh	Engineering draftsman	5 00 per day	1,405 00		1,405 00
L. B. Westfall	Engineering draftsman	5 00 per day	1,365 00		1,365 00
J. J. Cosgrave	Architectural draftsman	150 per month	1,630 00		1,630 00
F. E. Blake	Mechanical engineer and draftsman	200 per month	2,400 00		2,400 00
C. P. Wiweke	Mechanical draftsman	150 per month	1,650 00		1,650 00
T. L. Ainsworth	Tracer	75 per month	25 54		25 54
Leroy Bamer	Tracer	83 33 per month	1,000 00	37 71	1,037 71
C. S. Cooper	Tracer	60 per month	630 97		630 97
J. H. Forth	Tracer	83 33 per month	567 18		567 18
Bernard Gazier	Tracer	83 33 per month	1,000 00		1,000 00
C. J. Hall	Tracer	60 per month	660 00		660 00
W. J. Henk	Tracer	83 33 per month	916 67		916 67
C. T. Kniskern, Jr	Tracer	83 33 per month	333 36		333 36
P. R. Murray	Tracer	83 33 per month	916 67		916 67
Reuben Rudermann	Tracer	60 00 per month	521 48		521 48
R. N. Barrett	Assistant engineer	6 00 per day	888 00		888 00
H. W. Benedict	Assistant engineer	7 00 per day	1,742 00	39 06	1,781 06
W. C. Bratton	Assistant engineer	5 00 per day	975 00		975 00
Clark Brown	Assistant engineer	7 00 per day	2,191 00		2,191 00
N. E. Cottrell	Assistant engineer	5 00 per day	1,565 00		1,565 00
D. H. Daley	Assistant engineer	7 00 per day	2,191 00		2,191 00
F. M. Eames	Assistant engineer	7 00 per day	2,198 00		2,198 00
Ely Gamse	Assistant engineer	5 00 per day	200 00		200 00
M. W. Grimes	Assistant engineer	6 00 per day	1,578 00		1,578 00
F. B. Hall	Assistant engineer	6 00 per day	1,816 00		1,816 00
C. L. Hayward	Assistant engineer	6 00 per day	852 00		852 00
T. R. Haselum	Assistant engineer	6 00 per day	1,446 00		1,446 00
R. L. Holt	Assistant engineer	6 00 per day	1,434 00		1,434 00
D. R. Lee	Assistant engineer	7 00 per day	2,191 00		2,191 00
O. F. Lewis	Assistant engineer	6 00 per day	1,404 00	1 45	1,405 45
T. J. Loonie	Assistant engineer	5 00 per day	960 00	8 72	968 72
J. B. Maguire	Assistant engineer	7 00 per day	1,522 00		1,522 00
I. S. Matlaw	Assistant engineer	7 00 per day	1,218 00		1,218 00
John McBride	Assistant engineer	6 00 per day	818 00		818 00
C. W. Morris, Jr	Assistant engineer	6 00 per day	1,434 00	5 65	1,439 65
J. T. Murphy	Assistant engineer	5 00 per day	1,585 00		1,585 00
E. P. Neuschwander	Assistant engineer	7 00 per day	2,011 00		2,011 00
J. P. Newton	Assistant engineer	7 00 per day	2,191 00	1,001 83	3,192 83
J. A. O'Donnell	Assistant engineer	6 00 per day	1,722 00		1,722 00
J. A. Pritchard	Assistant engineer	5 00 per day	1,525 00	18 91	1,543 91
E. G. Raynor	Assistant engineer	7 00 per day	2,191 00		2,191 00
D. B. Sayer	Assistant engineer	6 00 per day	1,281 00		1,281 00
J. L. Southworth	Assistant engineer	5 00 per day	930 00		930 00
W. H. Slingerland	Assistant engineer	7 00 per day	2,191 00		2,191 00
H. S. Sparr	Assistant engineer	6 00 per day	1,443 00		1,443 00
J. H. Stevens	Assistant engineer	5 00 per day	1,310 00		1,310 00
Rupert Sturtevant	Assistant engineer	7 00 per day	2,191 00	50 74	2,241 74
E. W. Sylvester	Assistant engineer	6 00 per day	132 00		132 00
S. R. Tighe	Assistant engineer	6 00 per day	1,542 00		1,542 00
G. G. Underhill	Assistant engineer	7 00 per day	189 00	80 37	269 37
T. L. Watkins	Assistant engineer	6 00 per day	1,890 00		1,890 00
W. E. Weller	Assistant engineer	6 00 per day	1,591 00		1,591 00
J. B. Whipple	Assistant engineer	6 00 per day	912 00	1 05	913 05
C. M. Chuckrow	Assistant engineer	4 50 per day	630 00		630 00
Wayland Dickens	Leveler	5 00 per day	210 00		210 00
Mott Palmer	Leveler	5 00 per day	495 00		495 00
J. M. Prior	Leveler	5 00 per day	1,020 00		1,020 00
L. S. Rickard	Leveler	5 00 per day	320 00		320 00
Raymond Shelley	Leveler	4 50 per day	119 50		119 50
G. G. Sweet	Leveler	5 00 per day	1,565 00		1,565 00
R. W. Austin	Rodman	3 50 per day	576 00		576 00
M. A. Bantrell	Rodman	3 50 per day	339 00		339 00
J. S. Burns	Rodman	4 00 per day	672 50		672 50

Construction of Barge Canal — Head Office Account — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
W. V. T. Fonda	Rodman	$3 50 per day	$21 00	....	$21 00
G. B. Kelley	Rodman	4 00 per day	1,256 00	....	1,256 00
W. N. Langworthy	Rodman	4 00 per day	216 00	$4 76	220 76
E. H. Leggett	Rodman	3 50 per day	808 50	....	808 50
D. C. Ogsbury	Rodman	3 50 per day	91 00	....	91 00
H. J. Richardson	Rodman	4 00 per day	28 00	82 18	110 18
N. B. Robbins	Rodman	4 00 per day	836 00	....	836 00
C. J. Sullivan	Rodman	3 50 per day	276 50	....	276 50
J. J. Taney	Rodman	3 50 per day	73 50	....	73 50
G. T. Donahue	Chainman	2 50 per day	172 50	....	172 50
J. F. Duffy	Chainman	2 50 per day	782 50	....	782 50
Harvey Malcom	Chainman	3 00 per day	252 00	....	252 00
J. M. Wallace	Chainman	2 50 per day	445 00	....	445 00
E. V. Allendorph	Inspector of masonry	5 00 per day	1,565 00	....	1,565 00
M. S. Bierce	Inspector of masonry	5 00 per day	1,565 00	....	1,565 00
R. J. Maloy	Inspector of masonry	3 50 per day	854 50	....	854 50
J. M. Taylor	Inspector of masonry	5 00 per day	1,425 00	13 17	1,438 17
C. G. Hadley	Electrical inspector	150 per month	768 75	88 95	857 70
A. Anker	Laborer	2 00 per day	618 00	....	618 00
W. J. Atkinson	Laborer	2 00 per day	706 00	....	706 00
D. F. Allen	Laborer	2 00 per day	640 00	....	640 00
L. R. Baldwin	Laborer	2 00 per day	690 00	....	690 00
J. J. Barrett	Laborer	2 00 per day	636 00	....	636 00
J. H. Boyland	Laborer	2 00 per day	626 00	....	626 00
M. E. Brainerd	Laborer	2 00 per day	158 00	....	158 00
J. H. Byrnes	Laborer	2 00 per day	626 00	....	626 00
J. J. Cahill	Laborer	2 00 per day	132 00	....	132 00
W. C. Clark	Laborer	2 00 per day	158 00	....	158 00
J. L. Daley	Laborer	2 00 per day	698 00	....	698 00
Patrick Degnan	Laborer	2 00 per day	114 00	....	114 00
Michael Dolan	Laborer	2 00 per day	636 00	....	636 00
Wm. J. Doyle	Laborer	2 00 per day	712 00	....	712 00
J. J. Duffy	Laborer	2 00 per day	626 00	....	626 00
W. H. Dugan	Laborer	2 00 per day	638 00	....	638 00
Peter Farnan	Laborer	2 00 per day	636 00	....	636 00
J. E. Farley	Laborer	2 00 per day	638 00	....	638 00
S. A. Feenan	Laborer	2 00 per day	630 00	....	630 00
J. M. Fogarty	Laborer	2 00 per day	552 00	....	552 00
P. J. Gaffney	Laborer	2 00 per day	166 00	....	166 00
S. Habbinger	Laborer	2 00 per day	24 00	....	24 00
O. A. Jacobs	Laborer	2 00 per day	106 00	....	106 00
Richard Kirk	Laborer	2 00 per day	158 00	....	158 00
W. T. Lansing	Laborer	2 00 per day	626 00	....	626 00
Wm. Leffler	Laborer	2 00 per day	122 00	....	122 00
Otto Linder	Laborer	2 00 per day	84 00	....	84 00
Myer Livingston	Laborer	2 00 per day	626 00	....	626 00
S. Lodewick	Laborer	2 00 per day	676 00	....	676 00
J. M. MacDonald	Laborer	2 00 per day	628 00	....	628 00
A. McDougall	Laborer	2 00 per day	106 00	....	106 00
F. W. McEnaney	Laborer	2 00 per day	630 00	....	630 00
P. J. McGoldrick	Laborer	2 00 per day	606 00	....	606 00
J. C. McShane	Laborer	2 00 per day	114 00	....	114 00
Leopold Miller	Laborer	2 00 per day	244 00	....	244 00
Amos Prescott	Laborer	2 00 per day	632 00	....	632 00
J. J. Roach	Laborer	2 00 per day	638 00	....	638 00
P. J. Ryan	Laborer	2 00 per day	226 00	....	226 00
W. J. Smith	Laborer	2 00 per day	676 00	....	676 00
H. J. Soules	Laborer	2 00 per day	626 00	....	626 00
H. A. Sweeney	Laborer	2 00 per day	626 00	....	626 00
Cuyler Ten Eyck	Laborer	2 00 per day	350 00	....	350 00
Michael Tierney	Laborer	2 00 per day	626 00	....	626 00
S. B. Warner	Laborer	2 00 per day	234 00	....	234 00
M. E. Baker	Axeman and office assistant	2 50 per day	912 50	....	912 50
P. F. Burmaster	Axeman and office assistant	2 50 per day	782 50	....	782 50
Edgar Hull	Axeman and office assistant	2 50 per day	810 00	....	810 00
J. J. Murnane	Axeman and office assistant	2 50 per day	790 00	....	790 00
P. D. Unger	Axeman and office assistant	2 50 per day	572 50	....	572 50
F. I. Kelly	Boatman	3 00 per day	275 00	12 25	287 25
Thomas Rattoone	Boatman	3 00 per day	707 00	....	707 00
F. E. Davis	Chauffeur	125 per month	1,250 00	109 01	1,359 01
J. J. Finn	Chauffeur	115 per month	1,230 00	174 55	1,404 55
F. M. Hill	Title maker	130 per month	1,530 00	....	1,530 00

Construction of Barge Canal — Head Office Account — (Concluded).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
E. M. Chamberlain	Night watchman	$80 per month	$960 00	....	$960 00
Cornelius Coutant	Night watchman (temporary)	80 per month	92 72	....	92 72
Sibella Carroll	Charwoman	1 25 per day	391 25	....	391 25
J. J. McManus	Foreman of borings	4 50 per day	1,084 50	....	1,084 50
E. H. Wetsel	Foreman of public works	5 00 per day	1,405 00	....	1,405 00
			$262,420 37	$11,003 81	$273,424 18
Incidental Expenses.					
Instruments, tools and appliances				$18 50	
Office rent				4,812 54	
Fuel and light				248 76	
Stationery and printing				7,558 55	
Postage				1,107 61	
Telephone and telegraph				1,861 26	
Miscellaneous				16,476 58	
					32,083 80
Total					$305,507 98

Construction of Barge Canal — Erie Canal.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. B. La Du	Division engineer	$400 per month	....	$568 17	$568 17
R. G. Finch	Supervising engineer	300 per month	$1,927 94	124 97	2,052 91
S. W. Belding	Resident engineer	250 per month	3,000 00	635 87	3,635 87
P. H. Dater	Resident engineer	250 per month	1,250 00	165 22	1,415 22
E. D. Hendricks	Resident engineer	250 per month	2,975 00	754 53	3,729 53
E. A. Lamb	Resident engineer	250 per month	3,000 00	344 05	3,344 05
G. I. Oakley	Resident engineer	225 per month	2,700 00	467 50	3,167 50
G. W. Stickney	Resident engineer	250 per month	3,000 00	253 41	3,253 41
Earle Talbot	Resident engineer	250 per month	1,500 00	172 85	1,672 85
H. E. Brainard	Bridge designer	200 per month	1,200 00	82 26	1,282 26
P. D. Wendell	Estimate clerk	250 per month	1,500 00	63 35	1,563 35
James J. Neville	Confidential stenographer to division engineer	200 per month	2,325 00	771 51	3,096 51
R. S. Foster	Stenographer	75 per month	450 00	....	450 00
P. J. Gaffey	Stenographer	75 per month	850 00	....	850 00
E. C. Lawler	Stenographer	75 per month	31 45	....	31 45
Georgina Pflaum	Stenographer	75 per month	900 00	....	900 00
J. L. Richards	Stenographer	100 per month	967 74	....	967 74
M. A. Suskie	Stenographer	75 per month	75 00	....	75 00
J. R. Thomas	Stenographer	75 per month	503 23	....	503 23
H. L. Clarke	Engineering draftsman	5 00 per day	400 00	....	400 00
J. A. Galvin	Engineering draftsman	5 00 per day	1,385 00	....	1,385 00
F. E. Gillen	Engineering draftsman	4 00 per day	1,252 00	....	1,252 00
E. L. Keeler	Engineering draftsman	5 00 per day	1,595 00	....	1,595 00
A. R. Mulligan	Engineering draftsman	4 00 per day	1,396 00	....	1,396 00
W. R. Abbott	Assistant engineer	6 00 per day	1,671 00	22 41	1,693 41
A. G. Austin	Assistant engineer	6 00 per day	2,004 00	352 67	2,356 67
T. S. Bailey	Assistant engineer	6 00 per day	1,967 00	583 80	2,550 80
R. N. Barrett	Assistant engineer	6 00 per day	576 00	19 51	595 51
Lewis Bartlett	Assistant engineer	7 00 per day	1,544 00	138 88	1,682 88
J. C. Bell	Assistant engineer	7 00 per day	2,356 00	695 31	3,051 31
Harold Bills	Assistant engineer	5 00 per day	1,665 00	....	1,665 00
C. E. Burleigh	Assistant engineer	5 00 per day	1,516 00	....	1,516 00
C. R. DeGraff	Assistant engineer	6 00 per day	1,120 00	17 62	1,137 62
E. C. Hackett	Assistant engineer	5 00 per day	1,255 00	5 50	1,260 50
F. W. Harris	Assistant engineer	6 00 per day	2,100 00	836 05	2,936 05
Edwin Hilborn	Assistant engineer	7 00 per day	987 00	92 61	1,079 61
Grant Huntley	Assistant engineer	5 00 per day	1,730 00	....	1,730 0

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
M. E. James	Assistant engineer	$7 00 per day	$2,426 00	$559 79	$2,985 79
G. H. Jones	Assistant engineer	5 00 per day	1,650 00		1,650 00
E. E. Kendall	Assistant engineer	7 00 per day	2,106 00	149 39	2,255 39
H. C. Kline	Assistant engineer	7 00 per day	2,266 00	121 14	2,387 14
C. A. Lansing	Assistant engineer	6 00 per day	1,920 00		1,920 00
T. J. Loonie	Assistant engineer	5 00 per day	370 00		370 00
Chester Moore	Assistant engineer	5 00 per day	1,730 00		1,730 00
C. W. Morris, Jr	Assistant engineer	6 00 per day	444 00		444 00
A. R. Morse	Assistant engineer	7 00 per day	1,644 00	172 04	1,816 04
W. N. Niles	Assistant engineer	5 00 per day	1,590 50		1,590 50
C. G. Ranney	Assistant engineer	7 00 per day	2,062 00	695 25	2,757 25
L. S. Rickard	Assistant engineer	5 00 per day	580 00		580 00
G. M. Rodger	Assistant engineer	5 00 per day	885 00		885 00
C. V. Smith	Assistant engineer	5 00 per day	1,608 50		1,608 50
S. M. Stuart	Assistant engineer	6 00 per day	1,182 00		1,182 00
W. J. Weigmann	Assistant engineer	7 00 per day	2,419 00	251 09	2,670 09
L. H. M. Whitney	Assistant engineer	6 00 per day	1,719 00	196 09	1,915 09
J. D. Williams	Assistant engineer	5 00 per day	1,355 00	45 19	1,400 19
M. W. Williams	Assistant engineer	7 00 per day	2,244 00	308 15	2,552 15
R. G. Baker	Leveler	4 50 per day	776 50		776 50
W. W. Brown	Leveler	5 00 per day	425 00		425 00
Wayland Dickens	Leveler	5 00 per day	125 50	84 62	210 12
A. O. Hollenbeck	Leveler	5 00 per day	1,614 00	488 61	2,102 61
E. Hulsapple	Leveler	5 00 per day	1,645 00		1,645 00
H. W. Jewell	Leveler	5 00 per day	1,600 00		1,600 00
A. T. Madison	Leveler	5 00 per day	1,575 00		1,575 00
Mott Palmer	Leveler	5 00 per day	460 00		460 00
C. P. Riley	Leveler	4 50 per day	1,204 50		1,204 50
C. E. Smith	Leveler	5 00 per day	1,630 00		1,630 00
R. B. Smith	Leveler	5 00 per day	1,715 00		1,715 00
B. Wich	Leveler	5 00 per day	795 00		795 00
C. G. Atkin	Rodman	4 00 per day	648 00		648 00
W. J. Bissell	Rodman	4 00 per day	684 00		684 00
L. J. Bradley	Rodman	3 50 per day	1,151 50		1,151 50
P. E. Collette	Rodman	3 50 per day	1,209 50		1,209 50
W. A. Dawson	Rodman	3 50 per day	940 00		940 00
H. L. Du Bois	Rodman	3 50 per day	1,222 00		1,222 00
John Edelstein	Rodman	3 50 per day	1,227 00		1,227 00
G. P. Edwards	Rodman	3 50 per day	765 00		765 00
F. B. Faille	Rodman	4 00 per day	1,151 00		1,151 00
E. W. Goff	Rodman	4 00 per day	1,380 00		1,380 00
P. Greenbaum	Rodman	4 00 per day	1,099 50		1,099 50
A. A. Griffin	Rodman	3 50 per day	497 00	1 30	498 30
J. H. Griffin	Rodman	3 50 per day	864 50		864 50
W. M. Griffith	Rodman	4 00 per day	1,380 00		1,380 00
J. Helfand	Rodman	3 50 per day	346 50		346 50
J. L. Herber	Rodman	3 50 per day	595 00		595 00
R. L. Kelly	Rodman	3 50 per day	803 50		803 50
W. N. Langworthy	Rodman	4 00 per day	1,096 00		1,096 00
G. H. Leet	Rodman	3 50 per day	1,186 50		1,186 50
E. H. Leggett	Rodman	3 50 per day	318 50		318 50
W. H. Mangan	Rodman	3 50 per day	1,115 00		1,115 00
L. A. McElveney	Rodman	3 50 per day	688 00		688 00
L. Y. Meneely	Rodman	4 00 per day	744 00		744 00
R. V. Nellis	Rodman	3 50 per day	514 50		514 50
L. C. Pope	Rodman	3 50 per day	301 00		301 00
G. R. Rankin	Rodman	4 00 per day	1,187 50		1,187 50
W. A. Rice	Rodman	3 50 per day	1,014 50		1,014 50
H. J. Richardson	Rodman	4 00 per day	840 00	121 61	961 61
W. C. Ruland	Rodman	3 50 per day	1,174 50		1,174 50
F. L. Teall	Rodman	4 00 per day	1,308 00		1,308 00
J. R. Tighe	Rodman	4 00 per day	640 00		640 00
Jas. A. Waddell	Rodman	3 50 per day	28 00		28 00
C. A. Wilbur	Rodman	4 00 per day	1,328 00		1,328 00
A. F. Bayly	Chainman	3 00 per day	819 00		819 00
F. S. Belotti	Chainman	3 00 per day	1,053 00		1,053 00
J. G. Bushnell	Chainman	3 00 per day	1,071 00		1,071 00
P. Cohen	Chainman	2 50 per day	112 50		112 50
H. V. G. Dumont	Chainman	3 00 per day	675 00		675 00
J. A. Kelly	Chainman	3 00 per day	605 00		605 00
J. V. Kivlen	Chainman	3 00 per day	573 00		573 00
A. A. Laughlin	Chainman	2 50 per day	390 00		390 00

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Harvey Malcolm	Chainman	$3 00 per day	$75 00	....	$75 00
W. E. Maxwell	Chainman	2 50 per day	97 50	....	97 50
J. J. MacDonald	Chainman	3 00 per day	585 00	....	585 00
S. D. Sibley	Chainman	2 50 per day	92 50	....	92 50
Wm. Smutsler	Chainman	2 50 per day	540 00	....	540 00
R. W. Stewart	Chainman	3 00 per day	495 00	....	495 00
F. B. Stoddard	Chainman	3 00 per day	1,053 00	....	1,053 00
C. B. Tebo	Chainman	3 00 per day	1,032 00	....	1,032 00
Geo. Terwilliger	Chainman	3 00 per day	507 00	....	507 00
H. J. Waldvogel	Chainman	3 00 per day	987 00	....	987 00
J. P. Walsh	Chainman	2 50 per day	558 00	....	558 00
H. J. Weir	Chainman	3 00 per day	768 00	....	768 00
J. A. Young	Chainman	3 00 per day	942 00	....	942 00
W. W. Barclay	Inspector of masonry	5 00 per day	190 00	....	190 00
J. A. Cahalin	Inspector of masonry	5 00 per day	1,695 00	....	1,695 00
H. B. Finan	Inspector of masonry	5 00 per day	1,700 00	....	1,700 00
W. H. H. Klinkhart	Inspector of masonry	5 00 per day	1,730 00	$8 46	1,738 46
S. Y. MacGregor	Inspector of masonry	5 00 per day	1,765 00	....	1,765 00
T. M. Oliver	Inspector of masonry	5 00 per day	1,445 00	....	1,445 00
James Sim	Inspector of masonry	5 00 per day	850 00	....	850 00
W. K. Smith	Inspector of masonry	3 50 per day	1,218 00	....	1,218 00
A. M. Wait	Inspector of public works	5 00 per day	1,195 00	....	1,195 00
Philip Gray	Caisson engineer	175 per month	378 23	....	378 23
A. O. Mitchell	Caisson engineer	175 per month	175 00	....	175 00
R. J. Clancy	Caisson inspector	175 per month	606 85	....	606 85
G. D. Mitchell	Caisson inspector	175 per month	379 17	....	379 17
D. A. Molitor	Caisson inspector	175 per month	379 17	....	379 17
E. H. Wetsel	Foreman of public works	5 00 per day	685 00	....	685 00
James Breslin	Movable dam tender	100 per month	1,200 00	....	1,200 00
H. E. Jordan	Movable dam tender	100 per month	335 48	....	335 48
Peter McGeough	Movable dam tender	100 per month	464 52	....	464 52
Frank McWenie	Movable dam tender	100 per month	1,200 00	....	1,200 00
E. P. Morsheimer	Movable dam tender	100 per month	400 00	....	400 00
J. J. Murphy	Movable dam tender	100 per month	1,200 00	....	1,200 00
Thos. Vaughn	Movable dam tender	100 per month	1,200 00	....	1,200 00
Wm. Andrews	Laborer	2 00 per day	234 00	....	234 00
W. J. Biggart	Laborer	2 00 per day	26 00	....	26 00
John Brindle	Laborer	2 00 per day	202 00	....	202 00
J. S. Butler	Laborer	2 00 per day	570 00	....	570 00
Thos. Dalton	Laborer	2 00 per day	676 00	....	676 00
Isaac Davis	Laborer	2 00 per day	548 00	....	548 00
Patrick Dorgan	Laborer	2 00 per day	342 00	....	342 00
L. Dowd	Laborer	2 00 per day	72 00	....	72 00
John Glynn	Laborer	2 00 per day	274 00	....	274 00
Amzi Gregg	Laborer	2 00 per day	206 00	....	206 00
James Holton	Laborer	2 00 per day	470 00	....	470 00
Nicholas Kane	Laborer	2 00 per day	36 00	....	36 00
P. W. Kavanagh	Laborer	2 00 per day	346 00	....	346 00
Frank Kelly	Laborer	2 00 per day	160 00	....	160 00
John Lavery	Laborer	2 00 per day	710 00	....	710 00
Wm. Leffler	Laborer	2 00 per day	58 00	....	58 00
A. Loeb	Laborer	2 00 per day	128 00	....	128 00
Edgar Lynd	Laborer	2 00 per day	724 00	....	724 00
D. F. Mahar	Laborer	2 00 per day	106 00	....	106 00
M. Mahoney	Laborer	2 00 per day	618 00	....	618 00
Daniel Malone	Laborer	2 00 per day	342 00	....	342 00
Wm. Mangus	Laborer	2 00 per day	100 00	....	100 00
Matthew McConnell	Laborer	2 00 per day	670 00	....	670 00
Henry McGuinis	Laborer	2 00 per day	502 00	....	502 00
J. J. McLaughlin	Laborer	2 00 per day	688 00	....	688 00
M. J. Moore	Laborer	2 00 per day	168 00	....	168 00
James Mulhaul	Laborer	2 00 per day	2 00	....	2 00
M. E. Mullaney	Laborer	2 00 per day	636 00	....	636 00
Bernard Reardon	Laborer	2 00 per day	274 00	....	274 00
P. V. Schuyler	Laborer	2 00 per day	700 00	....	700 00
J. P. Sheehan	Laborer	2 00 per day	242 00	....	242 00
G. R. Trombley	Laborer	2 00 per day	484 00	....	484 00
W. J. Walrod	Laborer	2 00 per day	96 00	....	96 00
S. B. Welch	Laborer	2 00 per day	656 00	....	656 00
J. P. Hughes	Axeman and office assistant	2 50 per day	712 50	....	712 00
C. E. Larkin	Axeman and office assistant	2 50 per day	430 00	....	430 50
H. J. Baker	Boatman	3 00 per day	327 00	....	327 00

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
James E. Collins	Boatman	$3 00 per day	$198 00		$198 00
W. M. Cook	Boatman	3 00 per day	959 00		959 00
Peter Crane	Boatman	3 00 per day	327 00		327 00
D. M. Crangle	Boatman	3 00 per day	177 00		177 00
M. Crowley	Boatman	3 00 per day	495 00		495 00
Geo. B. Deal	Boatman	3 00 per day	357 00		357 00
C. R. de Malignon	Boatman	3 00 per day	956 00		956 00
Barney Devlin	Boatman	3 00 per day	6 00		6 00
James Dillon	Boatman	3 00 per day	465 00		465 00
M. J. Dineen	Boatman	3 00 per day	252 00		252 00
P. J. Doorey	Boatman	3 00 per day	1,014 00		1,014 00
Wm. Duxbury	Boatman	3 00 per day	852 00		852 00
John Fahey	Boatman	3 00 per day	318 00		318 00
E. J. Farrell	Boatman	3 00 per day	18 00		18 00
J. A. Farrell	Boatman	3 00 per day	784 00		784 00
Wilbur Frank	Boatman	3 00 per day	330 00		330 00
Chas. A. Girard	Boatman	3 00 per day	27 00		27 00
J. L. Grogan	Boatman	3 00 per day	504 00		504 00
M. F. Guerin	Boatman	3 00 per day	522 00		522 00
Henry Henk	Boatman	3 00 per day	48 00		48 00
John Hime	Boatman	3 00 per day	330 00		330 00
J. P. Hooley	Boatman	3 00 per day	386 00		386 00
T. A. Keane	Boatman	3 00 per day	783 00		783 00
F. I. Kelly	Boatman	3 00 per day	432 00		432 00
Wm. Kneaskern	Boatman	3 00 per day	244 00		244 00
Stephen Lane	Boatman	3 00 per day	159 00		159 00
J. J. Lawler	Boatman	3 00 per day	375 00		375 00
Patrick Lillis	Boatman	3 00 per day	616 00		616 00
Wm. Lusso	Boatman	3 00 per day	759 00		759 00
T. F. Madden	Boatman	3 00 per day	981 00		981 00
C. E. McCarthy	Boatman	3 00 per day	891 00		891 00
Edw. McCauley	Boatman	3 00 per day	849 00		849 00
W. McMahon	Boatman	3 00 per day	270 00		270 00
J. F. Mitchell	Boatman	3 00 per day	360 00	$63 27	423 27
David Morris	Boatman	3 00 per day	1,008 00		1,008 00
R. Moxley	Boatman	3 00 per day	36 00		36 00
E. J. Mullarkey	Boatman	3 00 per day	514 00		514 00
James Murphy	Boatman	3 00 per day	891 00		891 00
Jos. Murray	Boatman	3 00 per day	171 00		171 00
P. J. Murray	Boatman	3 00 per day	240 00		240 00
Lee Nellis	Boatman	3 00 per day	90 00		90 00
F. L. Phalen	Boatman	3 00 per day	246 00		246 00
Peter Quinn	Boatman	3 00 per day	947 00		947 00
F. D. Ryan	Boatman	3 00 per day	237 00		237 00
Henry Schuyler	Boatman	3 00 per day	839 00		839 00
Frank Sherry	Boatman	3 00 per day	375 00		375 00
J. L. Sherry	Boatman	3 00 per day	477 00		477 00
Frank Shubert	Boatman	3 00 per day	48 00		48 00
Dewitt Sparks	Boatman	3 00 per day	825 00		825 00
C. F. Sprague	Boatman	3 00 per day	867 00		867 00
W. S. Stauring	Boatman	3 00 per day	168 00		168 00
Glenn L. Storms	Boatman	3 00 per day	602 00		602 00
W. J. Walrod	Boatman	3 00 per day	156 00		156 00
Myron Wells, Jr	Boatman	3 00 per day	868 00		868 00
P. Whelly	Boatman	3 00 per day	357 00		357 00
P. B. White	Boatman	3 00 per day	762 00		762 00
G. E. Whitbeck	Boatman	3 00 per day	468 00		468 00
John Yops	Boatman	3 00 per day	843 00		843 00
Godfrey Aman	Gage reader	7 00 per month	84 00		84 00
C. V. Barrett	Gage reader	5 00 per month	60 00		60 00
John Burns	Gage reader	7 00 per month	84 00		84 00
H. C. Dowling	Gage reader	7 00 per month	7 00		7 00
P. C. Earl	Gage reader	7 00 per month	56 00		56 00
Louis Fagan	Gage reader	7 00 per month	42 00		42 00
Frank Fayant, Sr	Gage reader	7 00 per month	84 00		84 00
John Fernald	Gage reader	5 00 per month	15 00		15 00
C. H. Fitch	Gage reader	7 00 per month	84 00		84 00
Edward Hagerty	Gage reader	7 00 per month	84 00		84 00
C. H. Hanson	Gage reader	7 00 per month	84 00		84 00
Herbert Hockle	Gage reader	10 00 per month	120 00		120 00
Roy Hubbard	Gage reader	7 00 per month	42 00		42 00
Wm. Jones	Gage reader	7 00 per month	77 00		77 00

Construction of Barge Canal — Erie Canal — (Concluded).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Lloyd Kast	Gage reader	$5 00 per month	$60 00	....	$60 00
Leo Laschen	Gage reader	14 00 per month	28 00	....	28 00
J. J. Lyons	Gage reader	5 00 per month	60 00	....	60 00
J. B. Mackey	Gage reader	7 00 per month	56 00	....	56 00
Frank McArthur	Gage reader	7 00 per month	84 00	....	84 00
C. G. Morse	Gage reader	7 00 per month	56 00	....	56 00
Jas. Murphy	Gage reader	7 00 per month	84 00	....	84 00
P. C. Pickard	Gage reader	7 00 per month	56 00	....	56 00
J. Reepmeyer, Jr	Gage reader	10 00 per month	120 00	....	120 00
E. P. Ryan	Gage reader	7 00 per month	91 00	....	91 00
A. M. Spencer	Gage reader	7 00 per month	56 00	....	56 00
John Stark	Gage reader	7 00 per month	56 00	....	56 00
W. C. Vrooman	Gage reader	7 00 per month	56 00	....	56 00
E. P. Walthart	Gage reader	14 00 per month	104 00	....	104 00
Minnie E. Wheeler	Gage reader	7 00 per month	84 00	....	84 00
Robert Wilson	Gage reader	6 00 per month	72 00	....	72 00
C. W. Young	Gage reader	14 00 per month	140 00	....	140 00
W. E. Young	Gage reader	7 00 per month	56 00	....	56 00
			$205,227 28	$10,434 05	$215,661 33
	Incidental Expenses.				
Instruments, tools and appliances				$58 11	
Office rent				2,175 00	
Fuel and light				490 60	
Stationery and printing				56 86	
Postage				188 24	
Telephone and telegraph				1,338 53	
Miscellaneous				6,068 30	
					10,375 64
Total					$226,036 97

Construction of Barge Canal — Champlain Canal.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. B. La Du	Division engineer	$400 per month	....	$209 75	$209 75
R. G. Finch	Supervising engineer	300 per month	$388 94	15 50	404 44
E. V. R. Payne	Resident engineer	250 per month	3,000 00	821 36	3,821 36
W. B. Watson	Resident engineer	225 per month	425 13	116 74	541 87
F. P. Williams	Resident engineer	250 per month	3,000 00	215 11	3,215 11
H. E. Brainard	Bridge designer	200 per month	600 00	31 08	631 08
G. W. Ruso	Clerk	150 per month	1,800 00	11 92	1,811 92
P. D. Wendell	Estimate clerk	250 per month	1,500 00	43 61	1,543 61
J. R. Cotter	Stenographer	75 per month	314 51	....	314 51
P. J. Gaffey	Stenographer	75 per month	50 00	....	50 00
J. E. Phinney	Stenographer	100 per month	1,200 00	....	1,200 00
H. L. Clarke	Engineering draftsman	5 00 per day	710 00	....	710 00
D. E. Damon	Engineering draftsman	5 00 per day	1,590 00	....	1,590 00
W. C. Benedict	Assistant engineer	7 00 per day	2,465 00	907 71	3,372 71
W. L. Caler	Assistant engineer	6 00 per day	1,332 00	151 11	1,483 11
C. A. Curtis	Assistant engineer	7 00 per day	2,314 00	195 43	2,509 43
J. B. Foote	Assistant engineer	6 00 per day	1,846 00	137 24	1,983 24
R. G. Gibson	Assistant engineer	6 00 per day	2,045 00	740 66	2,785 66
H. W. Hale	Assistant engineer	6 00 per day	1,308 00	19 90	1,327 90
R. D. Hayes	Assistant engineer	7 00 per day	2,113 00	465 06	2,578 06
B. T. Kenyon	Assistant engineer	6 00 per day	2,034 00	129 45	2,163 45
John McBride	Assistant engineer	6 00 per day	840 00	118 70	958 70
A. R. Morse	Assistant engineer	7 00 per day	541 00	119 05	660 05
L. S. Rickard	Assistant engineer	5 00 per day	670 00	....	670 00

Construction of Barge Canal — Champlain Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Raymond Shelley	Assistant engineer	$5 00 per day	$1,416 50		$1,416 50
J. L. Southworth	Assistant engineer	5 00 per day	45 00		45 00
S. R. Tighe	Assistant engineer	5 00 per day	135 00		135 00
E. W. Wendell	Assistant engineer	6 00 per day	1,602 00	$117 59	1,719 59
J. B. Whipple	Assistant engineer	6 00 per day	234 00		234 00
J. D. Williams	Assistant engineer	5 00 per day	260 00		260 00
W. D. Zielley	Assistant engineer	5 00 per day	1,325 00	4 56	1,329 56
J. S. Burns	Leveler	4 50 per day	702 00		702 00
Henry Cash	Leveler	4 50 per day	625 50		625 50
W. T. Hunt	Leveler	5 00 per day	1,690 00	71 25	1,761 25
Mott Palmer	Leveler	5 00 per day	715 00		715 00
R. W. Anderson	Rodman	4 00 per day	1,348 00		1,348 00
G. E. Deutschbein	Rodman	4 00 per day	1,323 00	2 50	1,330 50
E. F. Dossert	Rodman	3 50 per day	1,027 00		1,027 00
Byron Houghtaling	Rodman	4 00 per day	1,183 00	1 70	1,184 70
R. Jerrell	Rodman	4 00 per day	1,296 00	49 51	1,345 51
J. P. Kivlen	Rodman	3 50 per day	472 50		472 50
H. J. Richardson	Rodman	4 00 per day	464 00	113 52	577 52
G. L. Stillman	Rodman	4 00 per day	748 00		748 00
J. E. Cotter	Chainman	3 00 per day	1,017 00		1,017 00
D. O'Connell	Chainman	3 00 per day	957 00	9 20	966 20
J. J. Raup	Chainman	3 00 per day	1,053 00		1,053 00
G. A. Rogers	Chainman	3 00 per day	912 00		912 00
C. H. Smart	Chainman	2 50 per day	325 00	1 95	326 95
L. W. Donnelly	Inspector of masonry	5 00 per day	1,775 00		1,775 00
F. B. Kraft	Inspector of masonry	5 00 per day	1,630 00		1,630 00
R. W. Scott	Inspector of masonry	4 00 per day	1,213 00		1,213 00
Jas. Sim	Inspector of masonry	5 00 per day	760 00		760 00
F. G. Tilton	Inspector of masonry	5 00 per day	1,650 00		1,650 00
T. B. Bowes	Foreman of borings	4 50 per day	432 00		432 00
Fred Betts	Laborer	2 00 per day	716 00		716 00
A. F. Butler	Laborer	2 00 per day	280 00		230 00
D. H. Craw	Laborer	2 00 per day	506 00		506 00
T. J. Dailey	Laborer	2 00 per day	730 00		730 00
Patrick Dorgan	Laborer	2 00 per day	40 00		40 00
L. Dowd	Laborer	2 00 per day	32 00		32 00
D. J. Dwyer	Laborer	2 00 per day	106 00		106 00
Chas. Farley	Laborer	2 00 per day	440 00		440 00
Cornelius Fitzgerald	Laborer	2 00 per day	648 00		648 00
R. P. Ford	Laborer	2 00 per day	70 00		70 00
Michael Goldschmidt	Laborer	2 00 per day	416 00		416 00
Amzi Gregg	Laborer	2 00 per day	266 00		266 00
James Hayes	Laborer	2 00 per day	146 00		146 00
W. B. Hallock	Laborer	2 00 per day	46 00		46 00
P. W. Kavanagh	Laborer	2 00 per day	298 00		298 00
J. C. Kelso	Laborer	2 00 per day	306 00		306 00
John Lavery	Laborer	2 00 per day	20 00		20 00
D. J. Malone	Laborer	2 00 per day	298 00		298 00
Wm. Maloney	Laborer	2 00 per day	106 00		106 00
John Mansfield	Laborer	2 00 per day	38 00		38 00
Andrew McDermott	Laborer	2 00 per day	78 00		78 00
H. H. McMasters	Laborer	2 00 per day	108 00		108 00
Jas. Nolan	Laborer	2 00 per day	668 00		668 00
Hugh O'Connor	Laborer	2 00 per day	396 00		396 00
John Rock	Laborer	2 00 per day	652 00		652 00
J. F. Ryan	Laborer	2 00 per day	396 00		396 00
John Vaughn	Laborer	2 00 per day	60 00		60 00
L. R. Hellner	Axeman and office assistant	2 50 per day	800 00		800 00
C. B. McMasters	Axeman and office assistant	2 50 per day	832 50		832 50
Thos. Ryan, Jr	Axeman and office assistant	2 50 per day	825 00		825 00
E. L. Casey	Boatman	3 00 per day	498 00		498 00
T. D. Clancy	Boatman	3 00 per day	912 00		912 00
J. J. Cleary	Boatman	3 00 per day	612 00		612 00
J. H. Coniff	Boatman	3 00 per day	915 00		915 00
F. H. Craig	Boatman	3 00 per day	315 00		315 00
J. H. Dolan	Boatman	3 00 per day	171 00		171 00
J. Fox	Boatman	3 00 per day	999 00	11 80	1,010 80
M. F. Guerin	Boatman	3 00 per day	156 00		156 00
Edw. Harrigan	Boatman	3 00 per day	159 00		159 00
Jas. Holton	Boatman	3 00 per day	428 00		428 00
Wm. Hoy	Boatman	3 00 per day	818 00		818 00
J. P. King	Boatman	3 00 per day	159 00		159 00

Construction of Barge Canal — Champlain Canal — (Concluded).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
J. F. Malin	Boatman	$3 00 per day	$510 00		$510 00
H. J. MacShalley	Boatman	3 00 per day	679 00		679 00
J. F. Mitchell	Boatman	3 00 per day	321 00	$19 91	340 91
Patrick J. Murphy	Boatman	3 00 per day	578 00		578 00
P. J. Murray	Boatman	3 00 per day	453 00		453 00
J. Murray	Boatman	3 00 per day	465 00		465 00
J. H. Noonan	Boatman	3 00 per day	882 00		882 00
John Powers	Boatman	3 00 per day	159 00		159 00
C. J. Smith	Boatman	3 00 per day	609 00		609 00
H. G. Streeter	Boatman	3 00 per day	835 00		835 00
H. S. Tappin	Boatman	3 00 per day	204 00		204 00
P. J. Whalen	Boatman	3 00 per day	618 00		618 00
O. H. Whittenhall	Boatman	3 00 per day	962 00		962 00
E. H. Bowker	Gage reader	7 00 per month	56 00		56 00
L. C. Brasier	Gage reader	12 00 per month	144 00		144 00
F. E. Chapman	Gage reader	8 00 per month	104 00		104 00
S. L. Cluett	Gage reader	7 00 per month	63 00		63 00
J. H. Donnelly	Gage reader	7 00 per month	84 00		84 00
W. E. Downing	Gage reader	7 00 per month	56 00		56 00
W. B. Dunstan	Gage reader	7 00 per month	84 00		84 00
Edw. Durkin	Gage reader	7 00 per month	84 00		84 00
A. B. Fisher	Gage reader	7 00 per month	56 00		56 00
P. F. Gleason	Gage reader	7 00 per month	84 00		84 00
J. F. Hickey	Gage reader	8 00 per month	96 00		96 00
Andrew Leonhardt	Gage reader	7 00 per month	14 00		14 00
Dennis Monty	Gage reader	7 00 per month	14 00		14 00
G. P. Noyes	Gage reader	7 00 per month	84 00		84 00
W. H. Sigsworth	Gage reader	7 00 per month	84 00		84 00
E. H. Stickney	Gage reader	7 00 per month	63 00		63 00
B. F. Thebo	Gage reader	7 00 per month	84 00		84 00
H. C. Tinker	Gage reader	7 00 per month	21 00		21 00
			$85,442 58	$4,852 87	$90,295 45
Incidental Expenses.					
Instruments, tools and appliances				$108 39	
Office rent				1,091 64	
Fuel and light				207 98	
Stationery and printing				33 90	
Postage				140 58	
Telephone and telegraph				386 97	
Miscellaneous				2,415 12	
					4,384 58
Total					$94,680 03

Bureau of Bridges.

Chapter 811, Laws of 1911: Chapter 791, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
W. H. Yates	Supervising engineer	$400 per month	$757 11	$25 45	$782 56
J. M. C. Quarles de Quarles	Bridge designer	200 per month	19 35	22 26	41 61
Total			$776 46	$47 71	$824 17

Building Dikes, Delaware River, at Port Jervis.

Chapter 537, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. B. La Du	Division engineer	$400 per month	....	$13 57	$13 57
R. G. Finch	Supervising engineer	300 per month	$19 35	9 49	28 84
F. E. Davis	Chauffeur	125 per month	....	3 50	3 50
J. J. Finn	Chauffeur	100 per month	....	13 23	13 23
W. D. Zielley	Assistant engineer	6 00 per day	434 00	29 32	463 32
Thos. Dillon, Jr	Boatman	3 00 per day	234 00	....	234 00
Walter Parshall	Laborer	2 00 per day	122 00	....	122 00
			$809 35	$69 11	$878 46
	Incidental Expenses.				
Stationery and printing				$13 98	
Postage				1 40	
Telephone and telegraph				70	
Miscellaneous				24 27	
					40 35
Total					$918 81

Construction of Docks at Port of New York.

Chapter 547, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. B. La Du	Division engineer	$400 per month	....	$22 15	$22 15
R. G. Finch	Assistant engineer	7 00 per day	$28 00	49 85	77 85
G. M. Rodger	Leveler	5 00 per day	260 00	49 85	309 85
Harvey Malcolm	Chainman	3 00 per day	9 00	....	9 00
			$297 00	$121 85	$418 85
	Incidental Expenses.				
Miscellaneous				$141 25	
					141 25
Total					$560 10

Improvement of Mohawk River and West Canada Creek.

Chapter 132, Laws of 1911; Chapter 215, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
R. G. Finch	Supervising engineer	$300 per month	$148 35	$115 80	$264 15
Wayland Dickens	Leveler	5 00 per day	115 00	142 81	257 81
H. J. O'Hara	Leveler	5 00 per day	1,030 00	8 37	1,038 37
John J. Taney	Rodman	3 50 per day	562 00	....	562 00
Harvey Malcolm	Chainman	3 00 per day	45 00	....	45 00
Wm. Leffler	Laborer	2 00 per day	42 00	....	42 00
Ralph Perry	Laborer	2 00 per day	148 00	....	148 00
Jas. L. Daly	Boatman	3 00 per day	273 00	....	273 00
Jas. Murnane	Boatman	3 00 per day	210 00	....	210 00
			$2,573 35	$266 98	$2,840 33
	Incidental Expenses.				
Office rent				$94 00	
Fuel and light				4 90	
Livery				2 00	
Postage				6 30	
Telephone and telegraph				5 00	
Miscellaneous				71 33	
					183 53
Total					$3,023 86

Canal Surveys.

Chapter 220, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. B. La Du	Division engineer	$400 per month		$77 20	$77 20
J. J. Finn	Chauffeur	115 per month		16 75	16 75
S. R. Bellows	Assistant engineer	7 00 per day	$917 00	629 02	1,546 02
S. E. Brettheimer	Assistant engineer	6 00 per day	629 00		629 00
R. G. Finch	Assistant engineer	7 00 per day	7 00	13 25	20 25
L. T. Howard	Assistant engineer	7 00 per day	826 00	349 42	1,175 42
F. Leiser, Jr	Assistant engineer	5 00 per day	568 50		568 50
I. S. Matlaw	Assistant engineer	7 00 per day	462 00		462 00
Jacob Bendel	Leveler	5 00 per day	655 00		655 00
J. B. Doughty	Leveler	5 00 per day	590 00		590 00
S. B. Sheridan	Leveler	5 00 per day	615 50		615 50
J. P. Byrne	Rodman	3 50 per day	458 50		458 50
J. H. Griffin	Rodman	3 50 per day	80 50		80 50
J. J. MacDonald	Chainman	3 00 per day	354 00		354 00
Wm. F. Cain	Laborer	2 00 per day	18 00		18 00
John Cavanagh	Laborer	2 00 per day	114 00		114 00
Wm. Hannah	Laborer	2 00 per day	252 00		252 00
L. L. Larney	Laborer	2 00 per day	162 00		162 00
Edw. Bauch	Boatman	3 00 per day	444 00		444 00
Robt. Brenner	Boatman	3 00 per day	171 00		171 00
John F. Burns	Boatman	3 00 per day	378 00		378 00
Andrew Cocoran	Boatman	3 00 per day	393 00		393 00
James Curtis	Boatman	3 00 per day	393 00		393 00
Cornelius Desmond	Boatman	3 00 per day	381 00		381 00
Thos. F. Dillon, Jr	Boatman	3 00 per day	183 00		183 00
Rheinhard Dittrich	Boatman	3 00 per day	159 00		159 00
John F. Dunne	Boatman	3 00 per day	390 00		390 00
James Fagan	Boatman	3 00 per day	390 00		390 00
Wm. Golden	Boatman	3 00 per day	177 00		177 00
J. L. Grogan	Boatman	3 00 per day	144 00		144 00
Wm. J. Hall	Boatman	3 00 per day	396 00		396 00
Luke A. Halpin	Boatman	3 00 per day	393 00		393 00
Julius Kaiser	Boatman	3 00 per day	441 00		441 00
Samuel Karschstart	Boatman	3 00 per day	204 00		204 00
Wm. J. Keefe, Jr	Boatman	3 00 per day	387 00		387 00
Wm. L. Kelly	Boatman	3 00 per day	366 00		366 00
John J. Kenny	Boatman	3 00 per day	354 00		354 00
Otto Linder	Boatman	3 00 per day	405 00		405 00
Attilio Marrone	Boatman	3 00 per day	3 00		3 00
Daniel McCarthy	Boatman	3 00 per day	30 00		30 00
Jos. McCready	Boatman	3 00 per day	168 00		168 00
Geo. McKague	Boatman	3 00 per day	203 00		203 00
John J. McMahon	Boatman	3 00 per day	393 00		393 00
Thomas Meade	Boatman	3 00 per day	384 00		384 00
Patrick E. Meehan	Boatman	3 00 per day	48 00		48 00
James F. Merritt	Boatman	3 00 per day	405 00		405 00
C. Ottmer	Boatman	3 00 per day	447 00		447 00
Richard O'Toole	Boatman	3 00 per day	378 00		378 00
P. H. Quinn	Boatman	3 00 per day	183 00		183 00
J. J. Rice	Boatman	3 00 per day	317 00		317 00
S. F. Roberts	Boatman	3 00 per day	198 00		198 00
T. F. Scanlon	Boatman	3 00 per day	33 00		33 00
David Shapiro	Boatman	3 00 per day	396 00		396 00
Jos. Stern	Boatman	3 00 per day	210 00		210 00
			$17,054 00	$1,085 64	$18,139 64

Incidental Expenses.

Office rent	$72 00	
Fuel and light	1 49	
Stationery and printing	3 75	
Postage	10 36	
Telephone and telegraph	15 18	
Miscellaneous	814 19	
		916 97
Total		$19,056 61

Surveys, Field Notes and Manuscript Maps.

Chapter 511, Laws of 1912; Chapter 290, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edwin Hilborn	Assistant engineer	$7 00 per day	$1,128 00	$123 93	$1,251 93
C. L. Hayward	Assistant engineer	6 00 per day	786 00	....	786 00
C. M. Chuckrow	Leveler	4 50 per day	85 50	....	85 50
W. J. Bissell	Rodman	4 00 per day	108 00	....	108 00
J. H. Griffin	Rodman	3 50 per day	94 50	....	94 50
Jos. Kirchenbaum	Rodman	3 50 per day	280 00	....	280 00
L. A. McElveny	Rodman	3 50 per day	458 50	....	458 50
A. F. Bayly	Chainman	3 00 per day	138 00	....	138 00
Wm. Kemp, 2nd	Rodman	3 50 per day	290 50	....	290 50
A. A. Laughlin	Chainman	2 50 per day	117 50	....	117 50
R. W. Stewart	Chainman	3 00 per day	90 00	....	90 00
Geo. Terwilliger	Chainman	3 00 per day	453 00	....	453 00
J. P. Walsh	Chainman	2 50 per day	115 00	....	115 00
I. V. Davis	Laborer	2 00 per day	112 00	....	112 00
M. Mahoney	Laborer	2 00 per day	40 00	....	40 00
H. H. McMasters	Laborer	2 00 per day	36 00	....	36 00
C. E. Larkin	Axeman and office assistant	2 50 per day	67 50	....	67 50
Thos. A. Keane	Boatman	3 00 per day	198 00	....	198 00
J. Powers	Boatman	3 00 per day	381 00	....	381 00
			$4,979 00	$123 93	$5,102 93
	Incidental Expenses.				
Postage				$1 00	
Miscellaneous				98 34	
					99 34
Total					$5,202 27

Surveys for State Board of Claims.

Chapter 513, Laws of 1910; Chapter 811, Laws of 1911; Chapter 547, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edwin Hilborn	Assistant engineer	$7 00 per day	$49 00	....	$49 00
John McBride	Assistant engineer	5 00 per day	190 00	....	190 00
Wayland Dickens	Leveler	5 00 per day	297 50	$77 62	375 12
G. M. Rodger	Leveler	5 00 per day	270 00	108 24	378 24
Jas A. Waddell	Rodman	3 50 per day	28 00	....	28 00
Harvey Malcolm	Chainman	3 00 per day	183 00	....	183 00
Wm. Leffler	Laborer	2 00 per day	72 00	....	72 00
Total	....	....	$1,089 50	$185 86	$1,275 36

Examination of Monuments and Maps.

Chapter 513, Laws of 1910.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
O. F. Lewis	Assistant engineer	$7 00 per day	$500 00	$164 41	$664 41
			$500 00	$164 41	$664 41
Incidental Expenses.					
Livery				$46 75	
Stationery and printing				25	
Postage				80	
Telephone and telegraph				4 33	
Miscellaneous				336 08	
					388 21
Total					$1,052 62

Construction of Lock, Shinnecock and Peconic Canal.

Chapter 791, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. B. La Du	Division engineer	$400 per month		$17 60	$17 60
R. G. Finch	Supervising engineer	300 per month	$19 35	18 02	37 37
J. J. Finn	Chauffeur	100 per month		11 83	11 83
J. J. Cosgrave	Architectural draftsman	150 per month	20 00		20 00
S. T. Vosburgh	Engineering draftsman	5 00 per day	25 00		25 00
L. B. Westfall	Engineering draftsman	5 00 per day	65 00		65 00
M. W. Grimes	Assistant engineer	6 00 per day	60 00		60 00
R. L. Holt	Assistant engineer	6 00 per day	162 00	318 79	480 79
H. S. Sparr	Assistant engineer	6 00 per day	36 00		36 00
W. D. Zielley	Assistant engineer	5 00 per day	15 00		15 00
J. M. Prior	Leveler	5 00 per day	50 00		50 00
S. C. Sullivan	Chainman	2 50 per day	67 50		67 50
Robert Brenner	Boatman	3 00 per day	72 00		72 00
S. F. Roberts	Boatman	3 00 per day	69 00		69 00
J. M. Fogarty	Boatman	3 00 per day	12 00		12 00
H. H. McMasters	Boatman	3 00 per day	36 00		36 00
			$708 85	$366 24	$1,075 09
Incidental Expenses.					
Postage				$0 45	
Telephone and telegraph				1 90	
Miscellaneous				17 20	
					19 55
Total					$1,094 61

Dredging Peconic River.

Chapter 430, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
R. G. Finch	Supervising engineer	$300 per month	$9 68	$17 42	$27 10
R. L. Holt	Assistant engineer	6 00 per day	144 00	297 70	441 70
S. C. Sullivan	Chainman	2 50 per day	35 00		35 00
Robert Brenner	Boatman	3 00 per day	78 00		78 00
W. L. Kelly	Boatman	3 00 per day	12 00		12 00
S. F. Roberts	Boatman	3 00 per day	78 00		78 00
H. H. McMasters	Laborer	2 00 per day	52 00		52 00
			$408 68	$315 12	$723 80
Incidental Expenses.					
Postage				$0 71	
Telephone and telegraph				0 25	
Miscellaneous				5 50	
					6 46
Total					$730 26

Glenville–Rotterdam Crossing.

Chapter 714, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
I. S. Abrahams	Bridge designer	$150 per month	$75 00		$75 00
Henry Auerbach	Bridge designer	150 per month	58 33		58 33
Wayland Dickens	Leveler	5 00 per day	55 00	$84 97	139 97
J. M. Prior	Leveler	5 00 per day	25 00		25 00
J. A. Waddell	Rodman	3 50 per day	38 50		38 50
Harvey Malcolm	Chainman	3 00 per day	30 00		30 00
Wm. Leffler	Laborer	2 00 per day	20 00		20 00
			$301 83	$84 97	$386 80
Incidental Expenses.					
Miscellaneous				$0 60	
					60
Total					$387 40

Topographic Survey.

Chapter 547, Laws of 1912; Chapter 791, Laws of 1913.

In coöperation with the United States Geological Survey.

C. R. Allen	$30 00
Charles Atwood	65 17
J. L. Baldwin	355 50
R. S. Barnes	190 50
Gail Blanchard	42 00
G. W. Burrell	134 66
T. T. Callahan	18 50
A. B. Cobb	37 50
J. W. Cunningham	173 00
C. B. Elmore	183 00
G. M. Farney	279 50
R. C. Fitzgerald	173 00
J. S. Fits Patrick	178 00
S. P. Floore	595 20
W. H. Green	18 00
L. H. Hall	66 50
W. R. Hamlin	45 00
A. P. Hill	73 00
E. B. Hill	142 50
P. Hogan	139 00
A. J. Kavanagh	382 67
R. A. Kiger	693 35
Henry Lapier	34 00
J. F. McBeth	92 50
R. L. McCammon	192 00
Walter McCrea	51 25
R. C. McKinney	184 37
E. D. Monroe	430 32
W. H. S. Morey	973 81
W. J. Morrow	125 50
M. I. Omansky	112 50
Roscoe Reeves	438 40
K. E. Schlachter	132 00
F. L. Shalibo	289 50
T. F. Slaughter	187 00
G. R. Smith	12 00
G. S. Smith	453 10
J. F. Swan	85 00
K. W. Trimble	152 00
W. B. Upton, Jr	224 00
J. M. Whitman, Jr	796 30
E. E. Witherspoon	71 95
U. C. Zeluff	141 50
Total	$9,194 55

Hydrographic Survey.

Chapter 547, Laws of 1912; Chapter 791, Laws of 1913.

In coöperation with the United States Geological Survey.

Lester Allen	$41 67
Daniel Ames	35 50
R. S. Barnes	78 86
W. O. Birdsall	36 00
G. H. Canfield	138 03
W. E. Coe	36 00
C. C. Covert	90 02
C. S. De Golyer	142 08
John Finnegan	25 60
O. W. Hartwell	208 60
Erastus Ingraham	36 83
Helen Kimmey	14 00
Geo. J. Lyon	178 80
M. J. Maguire	34 94
John G. Mathers	16 67
D. L. Orcutt	33 07
J. L. Ross	11 00
Vashti Russell	36 00
Mrs. C. S. Rolles	24 00
Wm. Seeley	35 00
Lester Sevarie	27 00
E. G. Soltmann	5 76
Frank Weber	252 26
Frank Zock	42 67
A. Leschen & Sons Rope Co	152 23
Bartlett & Co	29 00
Total	$1,761 59

SUMMARY.

The foregoing tables are summarized as follows:

Ordinary Repairs to Canals.

1. Erie canal, chapter 546, Laws of 1912	$7,919 07
2. Champlain canal, chapter 546, Laws of 1912	4,080 93

Construction of Barge Canal.

3. Head office account, chapter 147, Laws of 1903; chapter 82, Laws of 1912	305,507 98
4. Erie canal, chapter 147, Laws of 1903; chapter 82, Laws of 1912	226,036 97
5. Champlain canal, chapter 147, Laws of 1903; chapter 82, Laws of 1912	94,680 03

Bureau of Bridges.

6. Bureau of bridges, chapter 811, Laws of 1911; chapter 791, Laws of 1913	824 17

Special Work.

7. Building dikes, Delaware river, at Port Jervis, chapter 537, Laws of 1912	918 81
8. Construction of docks at port of New York, chapter 547, Laws of 1912	560 10
9. Improvement of Mohawk river and West Canada creek, chapter 132, Laws of 1911; chapter 245, Laws of 1913	3,023 86

Special Surveys.

10. Canal surveys, chapter 220, Laws of 1913	19,056 61
11. Surveys, field notes and manuscript maps, chapter 511, Laws of 1912; chapter 290, Laws of 1913	5,202 27
12. Surveys for State Board of Claims, chapter 513, Laws of 1910; chapter 811, Laws of 1911; chapter 547, Laws of 1912	1,275 36
13. Examination of monuments and maps, chapter 513, Laws of 1910	1,052 62
14. Construction of lock, Shinnecock and Peconic canal, chapter 791, Laws of 1913	1,094 64
15. Dredging Peconic river, chapter 430, Laws of 1913	730 26
16. Glenville-Rotterdam crossing, chapter 714, Laws of 1913	387 40
17. Topographic survey, chapter 547, Laws of 1912; chapter 791, Laws of 1913	9,194 55
18. Hydrographic survey, chapter 547, Laws of 1912; chapter 791, Laws of 1913	1,761 59
Total	$683,307 22

TABLE OF CONTRACTS COMPLETED ON THE EASTERN DIVISION DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1913.

Special Work.

CONTRACTOR.	Date of contract.	Character of work.	ACT.		Appropriation.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
			Chap.	Year.				
Lathrop, Shea & Henwood Co.	Oct. 21, 1911	The improvement of the channel and banks of the Mohawk river and West Canada creek at Herkimer	132	1911	$75,000 00	$66,500 00	$68,479 00	$62,706 18
Aldrich & Hall, Inc.	July 23, 1912	Constructing a highway bridge over the Erie canal at Vliet street, Cohoes	488	1912	7,000 00	5,130 00	5,710 50	5,701 72
New York Submarine Contracting Co., Inc.	Dec. 24, 1912	Constructing a pier at Quarantine station, Rosebank, Staten Island	547	1912	22,000 00	21,500 00	20,000 00	20,000 00

Construction of the Barge Canal.

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
The Ferguson Contracting Co.	April 3, 1905	Contract No. 2, Erie canal — Through Waterford to contract No. 11	$1,022,640 00	$990,075 56	$689,687 63
Holler & Shepard	Dec. 8, 1909	Contract No. 2-E, Erie canal — Through Waterford to contract No. 11	263,189 40	307,022 57	279,184 18
Pittsburg-Eastern Co.	May 22, 1906	Contract No. 8, Erie canal — Dams and locks at Scotia, Rotterdam and Cranesville	1,518,382 00	1,516,788 98	*993,057 74

The Fort Orange Construction Co.	May 21, 1906	Contract No. 11, Erie canal — From contract No. 2 to Mohawk river	1,671,385 00	1,333,198 80	1,218,233 44
Penn Bridge Co.	Nov. 7, 1908	Contract No. 13, Erie canal — Bridges on contract No. 18.	12,303 50	10,171 00	9,932 18
The United Construction Co.	Dec. 20, 1906	Contract No. 16, Erie and Champlain canals — Bridges on contracts Nos. 11, 25 and 27	70,718 90	92,955 88	89,394 14
The Scofield Co.	Dec. 29, 1906	Contract No. 17, Erie canal — Dams and locks at Amsterdam and Tribes Hill	883,926 00	842,417 68	53,794 18
Alexander Murdoch	Mar. 3, 1908	Contract No. 17, Erie canal — Dams and locks at Amsterdam and Tribes Hill	836,220 76	812,286 46	751,351 60
Houston Barnard	Aug. 20, 1909	Contract No. 20-A, Erie canal — Little Falls to Castle Creek	499,000 00	320,678 70	320,690 94
Atlantic, Gulf & Pacific Co.	Nov. 19, 1906	Contract No. 25, Champlain canal — Comstock to Dunhams Basin	1,849,831 00	1,707,191 80	1,542,270 70
Casey & Murray	Sept. 2, 1908	Contract No. 31, Erie canal — Through Little Falls; Rocky Rift dam	813,800 00	831,302 28	751,341 76
The Hunkin-Conkey Construction Co.	Dec. 13, 1909	Contract No. 54, Champlain canal — Lock No. 7, at Fort Edward	232,908 00	251,370 10	223,158 51
I. A. Hodge & Co., Inc	Dec. 11, 1909	Contract No. 69, Champlain canal — Lock at lower Mechanicville	270,675 00	238,302 45	231,503 87
Lathrop, Shea & Henwood Co.	Nov. 4, 1911	Contract No. 88, Champlain canal — Reconstruction of a portion of bridge at Schuylerville	23,553 00	35,783 90	30,844 26
D'Olier Engineering Co.	April 12, 1910	Contract No. 90, Champlain canal — Power-supply and operating equipment at Smiths Basin, Comstock and Whitehall locks	94,093 65	92,238 30	88,873 75

* The balance due to complete this final payment was included in judgment rendered by the Board of Claims.

Special Work Connected with Barge Canal Construction.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
George W. Beeman*	Oct. 25, 1912	Excavating a channel in the Hudson river south of the sloop lock at Troy	....	$15,000 00	$14,658 24
T. M. Navagh†	April 17, 1913	Deepening the sloop lock at Troy	$5,677 00	5,677 00	5,135 00

* Work done by authorization of the Canal Board and according to an agreement entered into between George W. Beeman and the Superintendent of Public Works. Engineering work performed by representatives of this department.

† Work done by authorization of the Canal Board and in accordance with the contract awarded to T. M. Navagh by the Superintendent of Public Works. Engineering work performed by representatives of this department.

TABLE OF CONTRACTS PENDING ON THE EASTERN DIVISION, SEPTEMBER 30, 1913.

Special Work.

CONTRACTOR.	Date of contract.	Character of work.	ACT.		Appropriation.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1913.
			Chap.	Year.				
John Cuff	July 7, 1913	Construction of a flood protection along the Delaware river at Port Jervis	537	1912	$35,000 00	$30,354 00	$31,351 20	$24,500 00
State Highway Construction Co.	July 30, 1913	Completing the improvement of the channel and banks of the Mohawk river and West Canada creek at Herkimer	245	1913	60,000 00	52,940 00	50,240 00	2,250 00

Construction of the Barge Canal.

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1913.
Empire Engineering Corporation	April 18, 1905	Contract No. 1, Champlain canal — Hudson river, Northumberland to Fort Miller and Crocker's Reef to Fort Edward	$619,846 00	$580,423 57	$474,400 00
Sundstrom & Stratton	April 4, 1905	Contract No. 3, Champlain canal — Fort Miller to Crocker's Reef	760,576 00	657,273 08	633,290 00
The Foundation Co.†	July 6, 1912	Contract No. 8-A, Erie canal — Lock No. 8 and substructure of dam No. 4 at Scotia, and completion of locks and dams at Rotterdam and Cranesville	888,363 00	876,167 25	290,860 00
Acme Engineering & Contracting Co.	Sept. 10, 1907	Contract No. 14, Erie canal — Mohawk river, Crescent to Rexford Flats aqueduct; dams at Crescent and Mindenville; dams and locks at Vischer's Ferry, Canajoharie, Yosts and Fort Plain	2,875,570 00	2,985,224 72	2,588,500 00

John Henkes	Oct. 26, 1912	Contract No. 14-A, Erie canal — Clearing lands along Mohawk river, dam No. 2 to Rexford Flats	4,765 00	4,046 00	3,560 00
S. Pearson & Son, Inc	Aug. 2, 1909	Contract No. 20-B, Erie canal — Mohawk river, Mindenville to Canajoharie	848,540 00	1,032,210 20	762,890 00
American Pipe & Construction Co.	Aug. 18, 1909	Contract No. 20-C, Erie canal — Mohawk river, Canajoharie to Yosts	570,600 00	607,035 00	622,200 00
American Pipe & Construction Co.	Aug. 18, 1909	Contract No. 20-D, Erie canal — Mohawk river, Yosts to Rexford Flats	2,260,000 00	2,698,392 40	1,087,680 00
Kingsbury Construction Co.	Nov. 1, 1911	Contract No. 24, Champlain canal — Guard-gate at Crocker's Reef	46,692 00	44,368 00	37,150 00
The Kinser Construction Co.*	Nov. 23, 1906	Contract No. 27, Champlain canal — Dunhams Basin to Fort Edward	998,920 00	723,268 61	378,650 00
Holler & Shepard†	Dec. 1, 1910	Contract No. 27-A, Champlain canal — Dunhams Basin to Fort Edward	409,455 00	486,464 25	342,140 00
Maryland Dredging & Contracting Co.	April 3, 1909	Contract No. 29, Erie canal — Sterling creek to Herkimer-Oneida county line	812,350 00	691,250 36	483,130 00
Acme Engineering & Contracting Co.	July 16, 1909	Contract No. 30, Erie canal — Mohawk river, Little Falls to Sterling creek	2,650,500 00	2,681,761 12	1,950,250 00
Flood & Van Wirt Co.	Sept. 26, 1912	Contract No. 56, Champlain canal — Improvement of Glens Falls feeder	317,638 50	361,746 30	216,560 00
Shanley-Morrissey, Inc.*	Jan. 11, 1910	Contract No. 70, Champlain canal — Hudson river, Waterford to lock No. 1	749,300 00	779,636 50	236,240 00
Central Dredging Co.†	Oct. 22, 1912	Contract No. 70-A, Champlain canal — Hudson river, Waterford to lock No. 1	790,488 00	759,158 88	44,380 00
Shanley-Morrissey, Inc.*	Jan. 11, 1910	Contract No. 71, Champlain canal — Hudson river, lock No. 1 to lower Mechanicville	1,502,100 00	1,561,119 00	821,960 00
P. McGovern & Co.†	Jan. 16, 1913	Contract No. 71-A, Champlain canal — Hudson river, lock No. 1 to lower Mechanicville	1,017,625 03	1,286,389 06	318,830 00
Shanley-Morrissey, Inc.*	Dec. 14, 1909	Contract No. 72, Champlain canal — Hudson river, lower Mechanicville to Stillwater	1,439,733 00	1,221,111 75	618,900 00
James Stewart & Co., Inc.†	Mar. 27, 1913	Contract No. 72-A, Champlain canal — Hudson river, lower Mechanicville to Stillwater	1,396,585 50	1,534,603 25	382,950 00
Lathrop, Shea & Henwood Co.	Sept. 23, 1911	Contract No. 86, Erie canal — Reconstruction of a portion of bridge at Canajoharie	41,871 00	43,440 00	38,180 00
P. B. McCaghey & Co.	Feb. 17, 1913	Contract No. 87, Erie canal — Bridge near Rocky Rift dam, on contract No. 20-A	10,900 00	11,202 50	7,100 00
The Hollington Co.	Jan. 5, 1911	Contract No. 91, Erie canal — Hydro-electric power-plant at Crescent dam	44,600 00	44,985 50	38,840 00
MacArthur Bros. Co. & Lord Electric Co.	Feb. 17, 1913	Contract No. 92, Erie and Champlain canals — Power-plants, electrical equipment, etc., for Erie canal locks Nos. 2 to 19, inclusive, Champlain canal locks Nos. 1 to 8, inclusive, and guard-gate on contract No. 11	1,244,940 00	1,178,976 00	25,440 00
Jackson L. Richmond	Feb. 19, 1913	Contract No. 107, Erie canal — Lift-bridge and a fixed bridge at Little Falls	124,471 30	127,707 30	4,380 00

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* Suspended by order of the Canal Board. † Relet to complete former contracts.

TABLE OF CONTRACTS PENDING ON THE EASTERN DIVISION, SEPTEMBER 30, 1913 — (*Concluded*).

Special Work Connected with Barge Canal Construction.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1913.
Acme Engineering & Contracting Co...	Sept. 4, 1912	Agreement — Construction of a highway between Dunsbach and Forts Ferries, adjacent to contract No. 14..	$20,461 75	$20,461 75	$19,130 00
Acme Engineering & Contracting Co.	Sept. 9, 1912 June 9, 1913	Agreement — Construction of a highway known as the Rosendale road, adjacent to contract No. 14......	26,283 00	26,283 00	26,000 00
Acme Engineering & Contracting Co...	July 31, 1913	Agreement — Construction of a highway between Shaker pond and Niskayuna, adjacent to contract No. 14..	18,952 87	18,952 87	4,820 00

REPORT

OF THE

DIVISION ENGINEER

OF THE

MIDDLE DIVISION

For the Fiscal Year Ended September 30, 1913

MIDDLE DIVISION.

STATE OF NEW YORK,
DEPARTMENT OF STATE ENGINEER AND SURVEYOR,
MIDDLE DIVISION.

SYRACUSE, N. Y., *October* 1, 1913.

Hon. JOHN A. BENSEL, *State Engineer and Surveyor, Albany, N. Y.:*

Dear Sir.— I have the honor to submit herewith my annual report as Division Engineer of the Middle Division, New York State Canals, for the fiscal year ended September 30, 1913.

Navigation on the canals of the division has been uninterrupted throughout the season, there being no breaks or other accidents of sufficient import to prevent the passage of boats for any appreciable time.

The Oswego canal was closed from Barge canal lock No. 2 — Broadway bridge, Fulton — to Lake Ontario for the season of 1913 by the Superintendent of Public Works, under authority of chapter 242, Laws of 1913.

SPECIAL LEGISLATION.

CONSTRUCTION OF HIGHWAY BRIDGE OVER THE ERIE CANAL AT MATHEWS AVENUE, SOLVAY VILLAGE, ONONDAGA COUNTY.

(Chapter 47, Laws of 1912.)

Contractor, F. R. Bornhorst & J. R. Miller.

Engineer in charge, Carl F. Hopstein.

Engineer's estimate	$5,295 00
Contractor's bid	4,264 00
Final account, rendered Oct. 1, 1913	4,266 08

CONSTRUCTION OF HIGHWAY BRIDGE OVER THE BLACK RIVER CANAL AT EAST DOMINICK STREET, ROME.

(Chapter 877, Laws of 1912.)

Contractor, Lupfer & Remick.

Engineer in charge, L. C. Hulburd.

Engineer's estimate	$22,790 50
Contractor's bid	19,874 00
Work done to date	18,694 00

Chapter 510, Laws of 1912, provides for the construction of a reinforced concrete bridge over the Black River canal at Lyons Falls, in Lewis county, appropriating $45,000 therefor. Plans have been completed and the work advertised.

Chapter 246, Laws of 1913, provides for the construction of a bridge over the Black and Moose rivers at Lyons Falls, in Lewis county, appropriating $50,000 therefor. This is made up of $30,000 reappropriated from chapter 510, Laws of 1912, and $20,000 additional. Plans have been prepared and the work advertised.

Chapter 53, Laws of 1912, provides for the construction of a new bridge over the Black River canal at Main street, in the village of Boonville. Plans have been prepared and the work advertised.

Chapter 220, Laws of 1913, provides for making surveys for improving and extending the canal system of the State, including reconstruction of the Chemung canal. Surveys for this work were started in May, with Mr. Louis A. Burns, of Watertown, N. Y., in charge. Mr. Burns' report is appended.

BOARD OF CLAIMS.

In addition to the work usually required by the Superintendent of Public Works in connection with Ordinary Repairs, many surveys have been made of property alleged to have been damaged by the State, maps made and the data properly arranged for the use of the Board of Claims and Attorney-General. At the request of the Superintendent of Public Works a survey and estimate of cost has been made for constructing a dam at the foot of Chub lake, Herkimer county.

Chapter 728, Laws of 1913, provides for repairing the public dock at Willard, Seneca county, used by Willard State Hospital. The necessary surveys have been made, plans prepared and the work advertised.

STATE FAIR COMMISSION.

The work of making surveys, plans, estimate, etc., required by the State Fair Commission has been done from the division office and the cost of same paid by the Commission.

BLUE LINE SURVEY.

(Chapter 290, Laws of 1913.)

This law provides for surveys, field notes and manuscript map affecting various canals and canal lands.

The work on the Middle Division, under chapter 199, Laws of 1910, was assigned to Assistant Engineer E. C. Olcott, who made good progress until October, 1912, when he was forced to stop for lack of funds. He resumed the work May 1, 1913, under the new law.

During the season the topography and necessary surveys for establishing the old "red line" have been completed from Mud lock, near Onondaga lake outlet, to Willow street bridge in Syracuse, a distance of seven miles, and the old "blue line" from Mud lock to the City line, a distance of five miles. The office work, including the necessary computations and mapping, has been completed from Mud lock to Willow street bridge, seven miles.

Chapter 715, Laws of 1913, provides for the construction of a lift bridge over the Erie canal at West Genesee street, Syracuse. Preliminary surveys have been made.

Chapter 711, Laws of 1913, provides for the construction of a foot bridge over the Erie canal at Cornelia street, in the city of Utica. Surveys, estimate and plans have been made and the work advertised.

Chapter 654, Laws of 1913, provides for repairing the west pier at the foot of Owasco lake and dredging Owasco outlet. The necessary surveys and estimate of cost and plans have been made.

Chapter 735, Laws of 1913, provides for the reconstruction, repair and rebuilding of the bridge over the old Erie canal at South James street, Rome. A survey, plans and estimate were made, and the work was done during the season by the Superintendent of Public Works.

Chapter 745, Laws of 1913, provides for the construction of a highway bridge over the Erie canal at Yorkville. The necessary surveys have been made and the plans are under way.

BARGE CANAL.

The Middle Division of the Barge canal extends from the east line of Oneida county to the south line of Wayne county, a distance of, including Oneida and Cross lakes, 107.4 miles. It also includes the Oswego branch, extending from Three Rivers to Oswego, about 25 miles, the Cayuga and Seneca branch, extending from Montezuma aqueduct to Seneca lake at Geneva, 22 miles, and from Seneca lake to Montour Falls, 2.75 miles, and the territory covered by the Delta and Hinckley reservoirs in Oneida and Herkimer counties.

The main line of the Erie canal is divided into four sections, *viz.,* Residencies Nos. 4-A, 5, 6 and 7.

Residency No. 4-A extends from Oneida county line to Oriskany road, a distance of 8.76 miles, and on this division comprises contract No. 42-A and part of No. 93. Earle Talbot is in charge, with headquarters at Utica.

Residency No. 5 extends from Oriskany road bridge to Oneida lake, a distance of about 22.25 miles, and comprises contracts Nos. 43, 44 and 4, also part of contract No. 93. Daniel B. Donovan is engineer in charge, with headquarters at Rome.

Residency No. 6 extends from deep water in Oneida lake to Baldwinsville, a distance of about 23.4 miles, and includes contracts Nos. 45, 57, 90 and 101 and a portion of contracts Nos. 12, 13, 22, 93 and 100. D. C. Wedgeworth is engineer in charge, with headquarters at Syracuse.

Residency No. 7 extends from Baldwinsville to Wayne county line, a distance of about 32.7 miles. It includes contracts Nos. 5-A, 22-A and 46 and parts of contracts Nos. 12 and 22. E. J. Berry is engineer in charge, with headquarters at Syracuse.

The Oswego canal is divided into two residencies.

Residency No. 1 extends from Three River Point to Fulton, a distance of about 13 miles. It includes contracts Nos. 10, 10-A, 10-B, 33, 39, 53, 78, 80, 85, 90, 90-A, highways adjacent to contract No. 78, and Ox creek highways. T. M. Ripley is engineer in charge, with headquarters at Fulton.

Residency No. 2 extends from Fulton to Oswego, a distance of about 10.59 miles. It comprises contracts Nos. 35, 37 and 79 and parts of contracts 90, 90-A and 93. James Burden is engineer in charge, with headquarters at Oswego.

Water-Supply Residency comprises contracts Nos. 50, 51, 55 and 55-R, also highways adjacent to Delta and Hinckley reservoirs. L. C. Hulburd is in charge of work pertaining to Delta reservoir and contract No. 51, with headquarters at Rome. H. J. Morrison is engineer in charge of contract No. 50, with headquarters at Hinckley.

The Cayuga and Seneca canal is divided into two residencies.

Seneca Falls Residency is in charge of L. S. Hulburd, with headquarters at Seneca Falls. It includes contracts A, C, D and H and part of B.

Waterloo Residency is in charge of A. E. Steere, with headquarters at Waterloo. It includes contracts E and I and part of B.

The appended reports of the Resident Engineers on the division give in detail the work done on the various contracts. Following these reports are tables giving the name, rank and salary of all the employees on the division. Tables showing in figures the status of each contract are also appended.

With the exception of contract No. 46, which was cancelled by the Canal Board and is being prepared for reletting, dredging contract D on the Cayuga and Seneca canal, and three contracts, F, G and 110, having to do with the building of bridges over the canal and the building of power houses, lock equipment and one taintor dam, the entire length of the Barge canal across the division is under construction and in parts completed, while many of the contracts are well towards completion. The appended table, " A," will show in detail the condition of each contract.

The past year has seen the largest amount of work done since the beginning of Barge canal construction. The total for the year's work is $4,057,654, and the percentage of work done during the year is 15.8. The total amount of work done since the commencement of Barge canal construction is $16,315,276, and the percentage, 66.6.

In conclusion, I desire to commend to you for efficient and faithful service the entire engineering force of the division, and to thank you and Mr. Kastl, the Special Deputy, for the consideration and help you have given me in our efforts to carry on the work of the division.

Respectfully submitted,
EDWIN STYRING,
Division Engineer.

TABLE "A."

PROGRESS ON CONTRACTS, BARGE CANAL, MIDDLE DIVISION.

Erie and Oswego Canals.

CONTRACT NO.	Contract price, as affected by alterations.	Total amount of work done to October 1, 1913.	Work done during the year.	Per cent of work done to October 1, 1913.	Per cent of work done during the year.
4	$726,708	$720,073	0	Finished	0
4-B	1,351	1,333	0	Finished	0
5	156,941	125,820	0	Finished	0
5-A	326,902	319,351	$79,361	Finished	Finished
7	44,408	41,797	0	Finished	0
10	1,206,019	668,360	0	55.4	0
10-A	174,514	158,800	70,200	91.0	40.0
10-B	516,336	465,620	389,620	90.2	14.8
12	3,562,631	2,833,570	235,060	79.5	6.6
13	14,159	13,491	3,241	Finished	Finished
22	127,937	78,800	38,800	60.8	30.3
22-A	27,099	21,630	21,630	79.9	79.9
33	30,918	24,891	0	Finished	Finished
35	723,632	668,060	26,810	92.3	3.7
37	2,500,119	1,836,860	698,930	73.5	30.2
37-R	4,891	3,659	3,659	Finished	Finished
Road A	4,629	1,812	1,132	39.2	24.4
Road B	91,531	81,830	11,480	89.4	12.6
39	1,047,786	390,120	159,400	37.2	15.2
42	1,074,366	478,670	0	45.7	0
42-A	1,014,672	200,480	200,480	19.7	19.7
43	1,448,985	597,200	295,860	41.2	20.4
44	1,730,867	1,157,990	235,720	66.9	13.6
45	472,802	418,652	0	Finished	0
46	842,689	842,689	107,969	Finished	Finished
50	971,769	530,580	296,690	54.6	30.5
Highways on contract 50	41,927	34,090	34,090	81.3	81.3
51	400,227	231,690	82,060	57.9	20.5
53	167,585	164,576	0	Finished	0
55	945,840	883,350	0	Finished	0
55-R	7,561	7,526	0	Finished	0
Shelter on contract 55	2,234	2,234	2,234	Finished	Finished
Highways on contract 55	46,387	45,315	0	Finished	0
57	93,596	61,120	61,120	65.3	65.3
78	49,026	50,068	0	Finished	0
Highway on contract 78	15,420	16,734	0	Finished	0
9	37,480	33,980	0	Finished	0

TABLE "A"—(*Concluded*).

CONTRACT NO.	Contract price, as affected by alterations.	Total amount of work done to October 1, 1913.	Work done during the year.	Per cent of work done to October 1, 1913.	Per cent of work done during the year.
80	$117,391	$110,886	0	Finished	0
85	13,151	12,098	0	Finished	0
90	84,010	82,759	$1,778	Finished	Finished
90-A	64,020	22,440	890	35.2	1.2
93	379,693	400	400	0.1	0.1
100	179,061	0	0	0	0
101	40,984	23,730	20,430	57.9	49.8
102	25,993	0	0	0	0
103	197,995	20,610	20,610	10.4	10.4
104	39,370	34,190	33,600	86.8	85.4
Ox creek highways	73,353	62,150	58,590	84.8	79.9
Cayuga and Seneca Canal.					
A	$376,233	$300,520	$91,840	79.9	24.4
B	1,435,484	906,480	165,660	63.2	11.5
C	1,189,246	241,980	241,980	20.4	20.4
E	347,216	23,950	23,950	6.9	6.9
H	216,510	206,560	206,560	95.4	95.4
I	215,639	135,820	135,820	63.0	63.0
Totals	$25,647,293	$16,315,276	$4,057,654	66.6	15.8

APPENDED REPORTS — MIDDLE DIVISION.

Resident Engineers' Reports on Barge Canal Construction.

ERIE CANAL, RESIDENCY NO. 4-A.

Resident Engineer Earle Talbot reports:

This residency, with office at 211 Paul building, Utica, has supervision over two Erie canal contracts, one of which is in the Eastern Division and the other in the Middle Division. The extent of the residency is from Station 5130, near Sterling creek, to Station 5775, which is just east of the Oriskany road, a distance of 12.96 miles.

Contract No. 29, Eastern Division, Maryland Dredging and Contracting Company, contractors, extends from Station 5130 to the Herkimer-Oneida county line, a distance of four miles.

Contract No. 42-A, Middle Division, Grant Smith and Company and Locher, contractors, extends from the Herkimer-Oneida county line to Station 5775, near Oriskany road, a distance of 8.96 miles.

Contract No. 42-A.

This contract extends from the Herkimer-Oneida county line to Station 5775, near Oriskany road, a distance of 8.96 miles.

Charles R. Chase is Assistant Engineer in charge of the engineering on this contract, with office attached to the residency office in Utica.

This contract was formerly contract No. 42, under construction by Shanley-Morrissey, Incorporated. Work begun in July, 1909, was suspended in March, 1912. The contract was cancelled by resolution of the Canal Board on July 18, 1912. A small engineering force worked from March, 1912, to December, 1912, on plans and estimates for a new contract, and on the final estimate of contract No. 42.

Contract No. 42-A was awarded to Grant Smith and Company and Locher, and executed February 24, 1913. The contract provides for the completion of contract No. 42, as laid out in the original plans, with the addition of the following items not included in contract No. 42.

The driving of six-inch, triple-lap, Wakefield type, wooden sheet-piling to reinforce the canal banks in several places, where the available excavated material is of an inferior quality or where organic matter in layers underlies the canal embankment.

The excavation of a wide water, or turning basin, in the north side of the canal opposite the entrance to the Utica harbor lock, done under this contract to supply deficiencies in embankment material in the vicinity, where the prism cut is shallow.

The placing of a concrete floor in the tailbay of lock No. 20, between the guide walls, about 150 feet eastward from the lock, to carry the outflow across a sand bottom to a cemented gravel stratum, which crops out in the lower approach to the lock.

The contractors began operations immediately and the first work was the establishment of a three-unit pumping station at the east end of the lower approach to lock No. 20, which, with a ditch running west into the lock-pit, is handling the water in a very satisfactory manner.

The canal bank sheet-piling was taken under subcontract by Scott Brothers, and work was begun after high water on March 28, 1913. Rapid progress has been made in this, all the piling west of Genesee street being driven, about 41 per cent of the total amount.

The substructure and approaches of the Genesee street bridge were taken under subcontract by D. J. Beatson. Three of the approach walls are concreted, the south pier has been sheeted and excavated, and foundation piles driven preparatory to concreting. Plant is installed for work on the north pier. The substructure should be ready for the steel this year.

No work is being undertaken at the dive culverts, which will be completed in 1914.

A steam drag-line excavator has dug the north ditch and piled up the north embankment around the turning basin, Stations 5459 to 5472, and has thrown up levees to retain embankment material, which later will be pumped by dredge over the sheet-piling from Station 5466 to Station 5492, north side. This machine has also rehandled a large amount of material in the south spoil bank west of Schuyler street and has finished up this bank.

An electric drag-line excavator has finished the Mohawk river straightening channel south of Station 5585. The river is flowing in the new channel and the machine is excavating the prism between Stations 5576 and 5591, where the river formerly cut into the canal line. This work will shortly be completed.

The concrete stream entrance on the north side just east of lock No. 20, at Station 5639 + 90, has been completed except for stone protection.

At lock No. 20 the Horton Construction Company has a subcontract for foundation piles and sheet-piling, and has driven about 90 per cent of the piles, including the lower approach walls, north upper approach wall and east end of south upper approach wall footings. For concreting, the contractor has installed a one-yard Hains mixer, with belt conveyor system leading from sand and stone bins, which is operating in a very satisfactory manner. Concrete placed to date includes the entire south lower approach wall and about one-third of the lock footings, together with the lower buffer-beam section and one lock section nearly done. Work is progressing favorably and it is expected that all footings, together with the breast wall section and a number of lock sections complete, will be placed before the end of the year. Excavation along the lower approach was made with a drag-line excavator, which also rehandled the lock-pit excavation passed to it by a steel boom travelling derrick operating west.

This drag-line machine has continued west on the south bank, forming a bank between the west end of the upper approach wall and Cary road, and is now continuing forming the south bank west of Cary road toward Crane creek, where it will complete the necessary excavation for the spillway.

It is expected that Crane creek spillway will be constructed this year. West of Crane creek it is the intention of the contractor to form the south embankment where material can be obtained by the drag-line and to throw up levees with material now in place to form a basin into which enough suitable material will be subsequently pumped by the dredge and rehandled by drag-line into the finished embankment.

The attached table shows the amounts of work done under contract items since the letting of this contract, during the fiscal year and the percentages of work completed to date:

ITEMS OF WORK.		Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing	acres	4	0	0	0	0
Grubbing	cu. yds.	34,000	1,745	1,745	5.1	5.1
Excavation	cu. yds.	915,000	161,870	161,870	18.57	18.57
Sheeting and bracing	ft. B. M.	216,000	68,800	68,800	31.9	31.9
Embankment	cu. yds.	320,000	9,080	9,080	2.8	2.8
Lining	cu. yds.	3,630	0	0	0	0
Puddle	cu. yds.	390	0	0	0	0
Sawed lumber	ft. B. M.	1,300	0	0	0	0
Sawed lumber (needles)	ft. B. M.	11,000	0	0	0	0
Creosoted lumber	ft. B. M.	50,000	0	0	0	0
White oak	ft. B. M.	7,800	0	0	0	0
Foundation piles	lin. ft.	134,000	87,832	87,832	65.6	65.6
Mooring piles	lin. ft.	400	0	0	0	0
Wooden sheet-piling	ft. B. M.	180,000	51,810	51,800	23.8	23.8
Second-class concrete	cu. yds.	31,600	5,674	5,674	18	18
Reinforced concrete	cu. yds.	2,020	0	0	0	0
Finishing concrete surfaces	sq. ft.	1,000	0	0	0	0
Masonry bridge coping	cu. yds.	9	0	0	0	0
Wash wall	cu. yds.	60	0	0	0	0
Second-class stone paving	sq. yds.	2,690	0	0	0	0
Second-class riprap	cu. yds.	1,650	0	0	0	0
Structural steel	lbs.	707,100	0	0	0	0
Metal reinforcement	lbs.	232,000	2,300	2,300	1	1
Wrought iron	lbs.	2,260	0	0	0	0
Steel castings	lbs.	11,300	0	0	0	0
Iron castings, machined	lbs.	8,500	0	0	0	0
Portland cement sidewalks	sq. ft.	714	0	0	0	0
Curbing	lin. ft.	930	0	0	0	0
Cobblestone gutters	sq. yds.	380	0	0	0	0
Macadam pavement	sq. yds.	1,870	0	0	0	0
Wood block pavement	sq. yds.	1,375	0	0	0	0
Wooden fence	lin. ft.	4,180	0	0	0	0
Wrought iron pipe railing	lin. ft.	760	0	0	0	0
Lattice railing	lin. ft	444	0	0	0	0
Metal in lock-gates	lbs.	220,000	0	0	0	0
Metal in buffer-beams	lbs.	85,000	0	0	0	0
Metal in lock-valves	lbs.	34,000	0	0	0	0
Maintaining highway traffic	lump sum	1	30%	30%	30	30
Coffer-dams, pumping, etc	lump sum	1	0	0	0	0
Cleaning up site, etc	lump sum	1	0	0	0	0
Additional Items not included in Contract No. 42.						
Wooden sheet-piling	ft. B. M.	2,322,000	945,180	945,180	40.7	40.7
Second-class concrete	cu. yds.	1,105	0	0	0	0
Grubbing	cu. yds.	630	450	450	71.4	71.4
Excavation	cu. yds.	47,416	24,206	24,206	51.1	51.1
Embankment	cu. yds.	14,840	8,405	8,405	56.6	56.6
Standard field office		1	98%	98%	98	98

Percentage of total work done to date = 19.7 per cent.

ERIE CANAL, RESIDENCY NO. 5.

Assistant Engineer in Charge Daniel B. Donovan reports:

Contract No. 43.

This contract extends from Oriskany road on the east to about 1,500 feet west of Mud creek, a distance of 10.32 miles. The contract was awarded to the M. A. Talbott Company on October 15, 1909, for $1,320,560, and has since been increased by alterations to $1,448,985.05.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by Canal Board September 8, 1910, provides substructure for Mill street bridge not in original contract, and pile foundations for drive culverts on account of soft material.

Alteration No. 2, approved by Canal Board November 16, 1910, provides superstructure for Mill street bridge.

Alteration No. 3, approved by Canal Board November 22, 1910, increases size of junction lock to present Erie canal size.

Alteration No. 4, approved by Canal Board December 29, 1910, changes spoil banks on account of railroad changes.

Alteration No. 6, approved by Canal Board June 8, 1911, changes ditch on south side, Sta. 6130 to Sta. 6136, on account of change in spoil banks.

Alteration No. 7, approved by Canal Board December 14, 1911, changes ditch on south side, Sta. 6130 to Sta. 6136, to take care of Mohawk river.

Alteration No. 8, approved by Canal Board July 23, 1912, provides turning basin at Rome on account of contractor requiring material for railroad fill (no increase in cost); changes grade Mill street bridge to harmonize with street grade.

Alteration No. 9, approved by Canal Board October 22, 1912, changes abutments of retention dam to provide for bridge in future; changes embankment specifications to new standard.

Alteration No. 10, approved by Canal Board December 11, 1912, provides needle-dam at Nine-Mile creek sluice-gate and additional rack for operation of gate to facilitate repairs and operation.

Alteration No. 11, approved by Canal Board March 19, 1913, flattens side slopes and eliminates wash wall, Sta. 5851 to Sta. 6050, on account of soft material.

Alteration No. 12, approved by Canal Board April 22, 1913, modifies plans for guard-gates and foundations of junction lock on account of soft material.

The construction of this section of the canal has also necessitated the relocation of the main line of the New York Central railroad about a mile southerly of its present location and crossing overhead the Rome-Little Falls division of the New York State railways, the New York, Ontario & Western railroad, several streets and the Mohawk river on concrete arches and steel bridges, the change being about 3½ miles in length and requiring 1,600,000 cubic yards of embankment, all of which has been completed. The structures for this relocation have also been completed. Four tracks have been laid and it is expected by the railroad company to operate over the new line about December 1st. The New York, Ontario & Western railroad has been relocated, new buildings constructed and a bridge across the Barge canal for this railroad completed. The electric railway line of the New York State railways has been relocated and a bridge across the Barge canal for this railway has been constructed. Work is now about two-thirds completed on the relocation of over a mile of the Rome, Watertown & Ogdensburg division of the New York Central railroad, and a concrete arch over the Muck road has been completed and the bridge over the Barge canal completed, except the superstructure.

The construction of the Barge canal has progressed rapidly on this contract, the double cableway drag-line having excavated from near Nine-Mile creek to a point near Six-Mile creek. This machine has continued to excavate the prism, place and slope the embankment and spoil banks to completion, as it progresses.

The 20-inch hydraulic dredge *Stanwix* has worked between the east and west crossings of the present New York Central railroad. This portion of the contract, except for sloping of the prism, has been practically completed. In the early part of this year a 15-inch hydraulic dredge, the *Hanson*, was constructed and has excavated from the west crossing of the New York Central railroad to the west end of the contract, the sides of the prism having been sloped on this section by a Lidgerwood drag-line excavator. In general, the excavation of this section of the canal is completed with the exception of 1,500 feet at the east end, near Oriskany road, 1,000 feet at Nine-Mile creek, 15,000 feet from Six-Mile creek to the east crossing of the New York Central railroad, and a small amount in the vicinity of the junction lock at Rome. It is expected that all excavation will be completed during the coming year.

At the Oriskany road bridges no work was done, there remaining two concrete approach slabs and the approach embankments to be completed. The tumble gate at Nine-Mile creek sluiceway has been constructed and the sheet-piling for Nine-Mile creek entrance driven. There remains only paving for entrance and spillway to be done. The east guard-gate has been completed, with the exception of the steel gates, and the excavation for the spillway at this point is nearly completed. No work has been done at Six-Mile stream entrance or at other ditch entrances. The junction lock at Rome has been completed, except for the gates, the retention dam has been nearly completed, and the concrete at the west guard-gate is about one-half finished. No work has been done on the three dive culverts on this contract.

The following table shows the percentage of work done on each item of the contract, percentage done during the year and the whole amount of work done to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing ... acres	140	58.04	65.82	24.1	47
Excavation ... cu. yds.	5,547,355	1,142,880	2,401,364	20.6	43.3
Sheeting and bracing (new) ... ft. B. M.	419,600	64,024	87,184	15.2	20.8
Sheeting and bracing (reused) ... ft. B. M.	....	5,317	5,317	0	0
Forming embankment ... cu. yds.	242,200	46,092	107,210	19	44.2
Lining ... cu. yds.	4,630	305	305	6.5	6.5
Foundation piles ... lin. ft.	73,224	36,104	49,531	49.3	67.7
Wood sheet-piling ... ft. B. M.	418,600	141,600	254,712	33.8	58.8
Second-class concrete ... cu. yds.	23,493	7,905	11,732	33.6	50
Reinforced concrete ... cu. yds.	1,239	0	27	0	2.2
First-class masonry coping ... cu. yds.	6	2.9	2.9	4.8	4.8
Structural steel ... lbs.	589,400	0	559,300	0	95
Metal reinforcement ... lbs.	98,400	0	3,497	0	3.6
Wrought iron ... lbs.	2,700	0	1,318	0	48.8
Wooden fence ... lin. ft.	2,980	434	434	14.6	14.6
Metal in sluice-gate ... lbs.	46,500	20,000	20,000	43.1	43.1
Maintaining highway traffic ... lump sum	$8,000	0	$6,080	0	76
Coffer-dams, etc ... lump sum	$13,700	$2,040	$3,960	14.9	2.9
Paved gutters ... sq. yds.	150	142	142	94.8	94.8
Stone curbs ... lin. ft.	680	153	645	22.5	95
Creosoted lumber ... ft. B. M.	22,600	0	21,040	0	93.2
Wood-block paving ... sq. yds.	488	0	467	0	95.7
Lattice railing ... lin. ft.	192	0	187	0	97.5
Steel sheet-piling ... sq. yds.	14,000	14,000	14,000	100	100
Driving steel sheet-piling ... sq. yds.	29,000	15,010	15,010	51.8	51.8

Total of all work done during year = 21.0 per cent of estimated cost.
Total of all work done to date = 42.2 per cent of estimated cost.
Contract price, including alterations = $1,448,985.05.
Cost of work to date = $597,201.09.
Cost of work during year = $295,860.57.

Contract No. 44.

This contract extends from contract No. 43, 1,500 feet west of Mud creek, to the east end of contract No. 4, a distance of 7.8 miles, and was awarded on January 28, 1910, to Scott Bros. for $1,748,679, and has been decreased by alterations to $1,730,867.35.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by Canal Board April 27, 1910, changes spoil banks to facilitate work.

Alteration No. 2, approved by Canal Board December 29, 1910, changes spoil banks to facilitate work.

Alteration No. 3, approved by Canal Board June 28, 1911, changes plans of foundation of lock No. 21 on account of hard material.

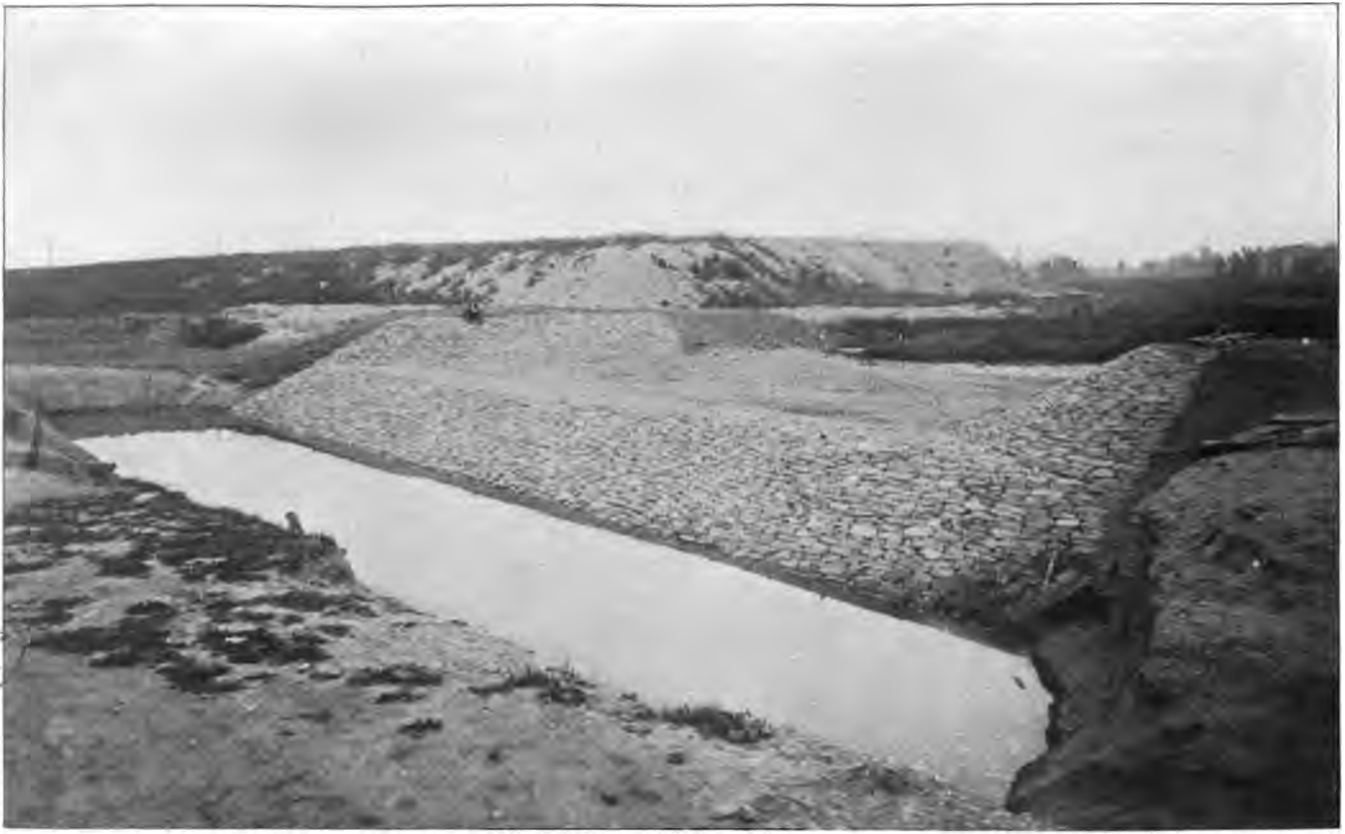
Alteration No. 4, approved by Canal Board November 1, 1911, provides additional sheeting and bracing at lock No. 21 and at approaches to locks Nos. 21 and 22 on account of soft material; changes method of construction at lock No. 22 to facilitate work.

Alteration No. 5, approved by Canal Board May 22, 1912, changes plans for foundations, etc., of junction lock at New London (piles unnecessary on account of hard material).

Alteration No. 6, approved by Canal Board August 27, 1912, provides concrete in bottom of prism below locks Nos. 21 and 22 in place of riprap to prevent scour; reduces grade of ditch on north side, Sta. 6580 to Sta. 6614 to minimize erosion.

Alteration No. 7, approved by Canal Board September 25, 1912, changes wash wall from Sta. 6580 to lock No. 21 and from lock No. 21 to lock No. 22, omitted where slopes are flattened as unnecessary and carried to grade at other points to insure stability.

Alteration No. 8, approved by Canal Board August 19, 1913, substitutes concrete for wash wall opposite approach walls to locks Nos. 21 and 22 and on south side of canal, Sta. 6580 to Sta. 6600, to obtain better construction; eliminates wash wall, Sta. 6320 to Sta. 6572, as unnecessary; improves approach of Stony brook bridge; provides diversion channel for Wood creek, to prevent



BARGE CANAL, CONTRACT No. 44.
Pavement at stream entrance, Stony brook.

flooding; provides diversion channel at junction lock, to facilitate construction; changes ditches, etc., to improve drainage.

On this contract the Erie canal at New London divides the excavation into two parts. East of the Erie canal crossing the contractors have had for the first part of the year a steam-shovel and also a tower scraper at work. There remain in this section about 200,000 cubic yards, which it is expected will be excavated during the coming year by the hydraulic dredge *Hanson*, which has been operating on the west end of contract No. 43. West of the Erie canal crossing a steam-shovel has been operating in the vicinity of New London, excavating in the prism and placing the material in embankment and approaches to the New London road bridge. There remain about 140,000 cubic yards to be excavated in this vicinity.

A derrick has been excavating for the lower approach walls to lock No. 21, but the excavation in front of this wall has not been completed. Two derricks have been excavating at lock No. 22 and a tower scraper has partially excavated for the lower approach wall and prism in front of the lock, there remaining about 100,000 cubic yards to be excavated. All prism excavation is practically completed on this contract, except as referred to above.

The approaches to the Stony brook road bridge have been completed and Stony brook stream entrance and spillway has been nearly completed. No work has been done at the junction lock at the crossing of the Erie canal during the past year, although, 1,800 cubic yards of concrete had been placed previously in the south lock wall. The approaches to the New London road bridge have been completed and traffic turned over the bridge. The spillway and dive culvert near Sta. 6550 were completed previous to this year. Lock No. 21 has been completed, including approach walls and gates. This lock has a life of 25 feet. Lock No. 22 and upper approach wall have been completed, there remaining to be done lower approach wall and gates. All structures on this contract have been practically completed excepting ditch entrances, junction lock and lower approach wall and gates at lock No. 22.

The following table shows the amounts and percentages of work done during the year and to date:

ITEMS OF WORK.		Preliminary estimate, as affected by alterations.	Work done during year.	Work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing	acres	100	0	97.39	0	97 39
Excavation	cu. yds.	3,238,370	318,144	2,311,547	9.84	71 4
Sheeting and bracing (new)	ft. B. M.	740,000	1,558	324,569	0 21	43 8
Sheeting and bracing (reused)	ft. B. M.	....	61,855	177,368	0	0
Round timber (new)	lin. ft.	9,470	0	5,858	0	62
Round timber (reused	lin. ft.	....	586	2,636	0	0
First-quality steel piling	sq. ft.	55,000	0	55,036	0	100 01
Second-quality steel piling	sq. ft.	132,000	12,876	50,401	9.76	38.2
Forming embankment	cu. yds.	182,000	42,254	119,230	23.2	65 6
Lining	cu. yds.	9,510	2,846	3,033	29.8	31 8
Puddle	cu. yds.	800	0	61	0	7.6
Sawed lumber	ft. B. M.	7,400	0	5,016	0	67 6
Sawed lumber in needles	ft. B. M.	37,000	16,252	16,252	44	44
White oak	ft. B. M.	22,500	9,479	9,479	42.1	42.1
Foundation piles	lin. ft.	67,650	1,635	37,521	2.4	55.4
Mooring piles	lin. ft.	770	0	135	0	17 5
Wooden sheet-piling	ft. B. M.	1,163,500	13,392	946,013	1.1	81.2
Second-class concrete	cu. yds.	103,560	20,243	64,010	19.5	61.8
Reinforced concrete	cu. yds.	550	7	510	1.3	92.8
First-class masonry coping	cu. yds.	5	3.25	4.9	65	99.9
Second-class stone paving	sq. yds.	3,880	661	1,413	17	36 4
Third-class stone paving	sq. yds.	1,190	234	234	19.6	19.6
Structural steel	lbs.	310,000	5,447	269,897	1.7	36.5
Metal reinforcement	lbs.	113,000	8,572	97,115	7.6	86
Steel castings	lbs.	44,000	4,918	12,205	11.2	27.8
Iron castings, plain	lbs.	1,400	113	791	8	56 5
Iron castings, machined	lbs.	67,000	9,789	54,637	14.6	81.5
Wooden pavement	sq. yds.	700	0	662	0	77
Wooden fence	lin. ft.	3,460	1,489	1,489	43.1	43 1
Metal in lock-gates	lbs.	705,000	186,766	258,536	26 5	36 7
Metal in buffer-beams	lbs.	260,000	49,255	81,155	18.9	31.2
Metal in lock-valves	lbs.	147,000	31,444	54,686	21.4	37.2
Maintaining highway traffic	lump sum	$1,500	$300	$1,275	20	85 1
Coffer-dams, etc	lump sum	$21,000	$1,600	$16,500	7.6	79
Excavation and embankment in lieu of sheeting and bracing	lump sum	$31,385 40	$3,138 54	$21,969 78	10	70

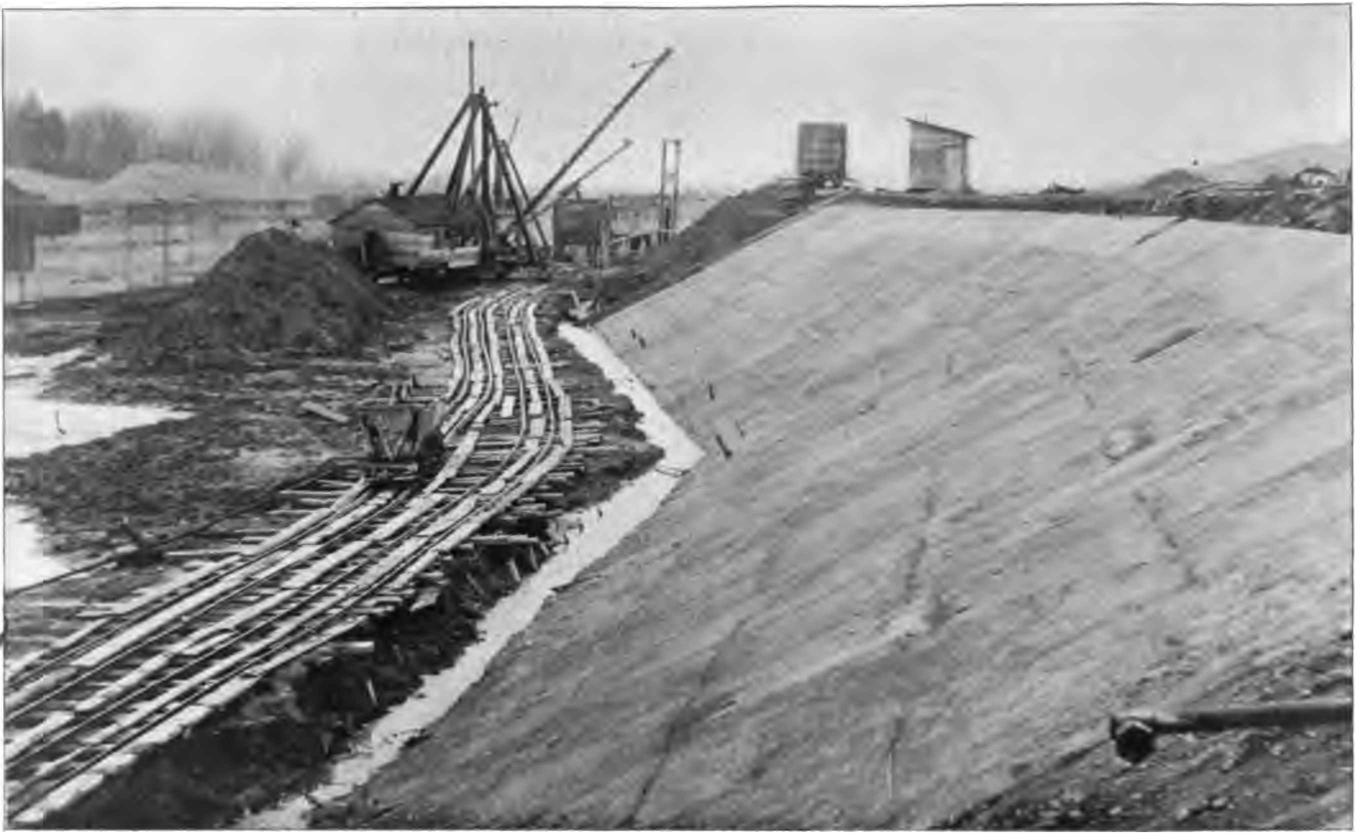
Total of all work done during year = 14.6 per cent of estimated cost.
Total of all work done to date = 67.0 per cent of estimated cost.
Contract price, including alterations = $1,730,867.35.
Cost of work to date = $1,157,995.00.
Cost of work done during year = $572,872.35.

Contract No. 4.

This contract extended from the west end of contract No. 44 to deep water in Oneida lake and was practically completed something over three years ago.

Contract No. 4-B.

This contract was for the construction of a culvert under the highway bridge at Burdick's road, near the east end of contract No. 4, and was completed two years ago.



Barge Canal, Contract No. 44.
Slope paving of concrete slabs in east approach to lock No. 21.

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ERIE CANAL, RESIDENCY NO. 6.

Resident Engineer D. C. Wedgeworth reports:

Contract No. 12.

This contract was let to the Stewart, Kerbaugh, Shanley Company of New York city on September 23, 1907. An assignment to James Stewart & Company was approved by the Superintendent of Public Works on August 25, 1910.

The total length of this contract, 43.7 miles, extends from deep water in Oneida lake to Mosquito Point bridge over the Seneca river. Of this distance 22.5 miles is in Residency No. 6, and the remainder in Residency No. 7.

The year 1912, ended October 1, closed with a ladder dredge working in Brewerton cut, a dipper dredge working just below Baldwinsville and another at Big Bend cut. Lock No. 23, proper, was finished and work was begun on the approach wall and foundation for power house, and the assembling of gates was in progress.

The working season closed with Brewerton cut well excavated to water level, but banks not sloped. Excavation at Oak Orchard dam was well begun. The drill boat, which had been working below Oak Orchard bridge, closed down in January. At lock No. 23 the gates were completed and power house foundation and lower approach wall built inside of coffer-dam. This lock was put under hand operation.

Work for this season began in May, with a dipper dredge working at Oak Orchard, cutting out the dam at this point in June. A drill boat began work below Oak Orchard bridge in May. In June another dredge joined the force at Oak Orchard. In September a dredge began work at the entrance to Oneida lake, on an unfinished section. As a whole this section of the canal is nearly completed in regard to excavation. A short section at Brewerton has yet to be excavated and the whole section has yet to be cleaned up and swept.

Back-filling and embankment have been made at lock No. 23.

As the year closes, work is in progress at Caughdenoy for the construction of a guard-gate, under an alteration; excavation is being made for abutments at Caughdenoy road bridge, and cribs are being built for docks at Brewerton

For the table showing the amount of work done to date, also a statement of alterations, see the combined report of contract No. 12, attached to the report of Residency No. 7.

Contract No. 101.

Contract No. 101 is for the construction of a highway bridge over the Erie canal at Three Rivers, Sta. 3293 + 43. This contract was let to Barrally & Ingersoll, August 8, 1912.

This contract has been modified by an alteration as follows:

Alteration No. 1, approved by Canal Board July 8, 1913, provides approach from the west at south end of bridge to allow access from old highway.

The close of that year saw this work well begun. Before the close of the season the abutments were completed and approaches well along. The approaches are completed, but the steel has been delayed. It is expected that it will be delivered soon.

The following table shows the amount of work done:

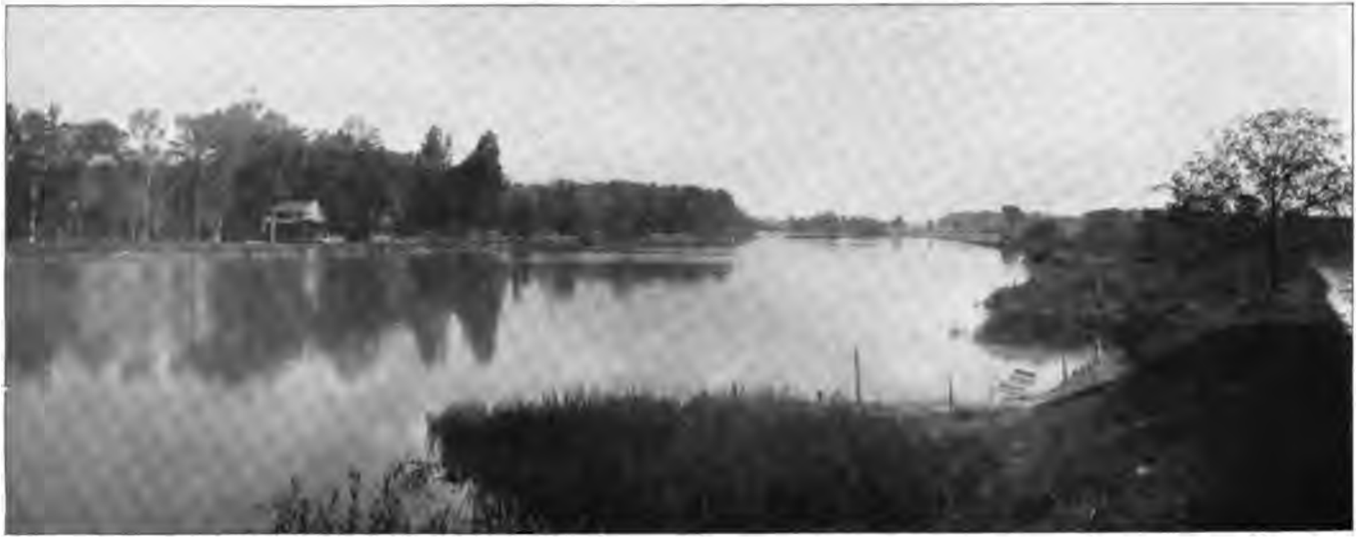
ITEMS OF WORK.	Preliminary estimate, as affected by alteration No. 1.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining, lump sum	$2,000	$1,500	$2,000	75	100
Excavation.........................cu. yds.	15,865	9,266	13,644	58.5	86
Forming embankment for bridge approach, cu. yds.	14,430	7,254	11,355	50.3	78.7
Lining.............................cu. yds.	211	38	38	18	18
Treated yellow pine sawed lumber...ft. B. M.	30,000	0	0	0	0
Foundation piles.....................lin. ft.	*9,350	9,060	9,060	96.8	96.8
Second-class concrete................cu. yds.	1,720	1,554	1,554	90.3	90.3
Third-class concrete.................cu. yds.	63	51	51	80.9	80.9
Third-class stone paving............ sq. yds.	10	7	7	70	70
Structural steel.........................lbs.	309,000	0	0	0	0
Metal reinforcement....................lbs.	1,100	520	520	47.3	47.3
Wooden fence........................lin. ft.	4,195	0	0	0	0
Gross estimate............................	$40,983.50	$20,430	$23,730	49.8	57.9

Engineer's estimate, $44,599.50; contract price, $40,983.50.

* This item was increased to 9,350 lin. ft. by resolution of Canal Board, dated January 29, 1913.

Contract No. 22.

The larger part of this contract is in Residency No. 7, the only part in Residency No. 6 being the raising of Cold Spring



Barge Canal, Contract No. 12.
The Oneida river a short distance above Three River Point,— typical of canal construction in a river channel.

bridge. This work is practically completed, approaches are to grade and guard fence reset.

For table of work done and statement of alterations, see report on Residency No. 7.

Contract No. 100.

This contract is for the construction of highway bridges at Hinmanville, Belgium and Long Branch, and was let to the W. J. Burns Co. of Syracuse, September 12, 1913. The only part of this contract on this residency is the bridge at Belgium.

No work has been done at this point.

Contract No. 93.

This contract is for furnishing power plants, electrical equipment and machinery for several locks, the only one of which on this residency is lock No. 23. This contract was let to MacArthur Bros. Co. & Lord Electric Co., August 12, 1913.

No work has been done.

Finished Contracts.

Contracts Nos. 45, 90 and 13 are complete and final accounts rendered.

ERIE CANAL, RESIDENCY NO. 7.

Resident Engineer Edward J. Berry reports:

Contract No. 46.

John G. Palmer, Assistant Engineer, in charge of construction.

This contract is for the construction of the Barge canal from Fox Ridge to the southeast corner of the town of Galen, a distance of 9.44 miles. The following structures are included in this contract: Lock No. 25 and movable dam at May's Point; bridge at Wayne county line, and toll road bridge at Montezuma.

Contract No. 46 was awarded to the Kinser Construction Company on November 23, 1908.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board September 29, 1910, provides additional piles and sheet-piling for foundation of dam at May's Point on account of soft material.

Alteration No. 2, approved by Canal Board December 29, 1910, changes plant of south abutment of dam at May's Point on account of soft material.

Alteration No. 3, approved by Canal Board December 27, 1911, changes foundations of lock No. 25 on account of soft material; provides concrete lining in bottom of canal below lock to prevent scour.

Alteration No. 4, approved by Canal Board September 25, 1912, changes plans for Toll road and County line bridges on account of soft material.

Alteration No. 5, approved by Canal Board December 31, 1912, eliminates sill across Seneca river opposite Sta. 5460 and Clyde river entrance at Sta. 5476 on account of change in water-surface elevation.

Alteration No. 6, approved by Canal Board August 19, 1913, eliminates all work unfinished on account of interference with railroad crossing.

At the movable dam the north embankment has been completed and the south embankment is about 75 per cent completed, the material being taken from borrow pits.

At the county line bridge the approaches are nearly finished and the foundation piles for the abutments are driven.

No work has been done at the toll road bridge.

At lock No. 25 the driving of the steel sheet-piling is nearly completed. The southwest approach wall is 70 per cent completed and the southeast approach wall is 80 per cent completed. A small amount of back-filling has been placed back of these walls.

In February, 1913, the contractors suspended work and removed part of their plant from the contract site.

Owing to the fact that the State could not provide a right of way for the entire site of the contract, the Canal Board passed a resolution on July 8, 1913, authorizing the elimination of the balance of the work remaining to be performed to complete the contract. This resolution is embodied in alteration No. 6.

The following table shows the percentage of work done during the fiscal year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1, 2, 3, 4, 5 and 6.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing........................lump sum	$5,000	0	$2,700	0	54
Excavation........................cu. yds.	4,967,910	10,181	3,835,797	0.2	77.2
Sheeting and bracing...............ft. B. M.	161,500	0	22,722	0	14.1
Forming embankment...............cu. yds.	69,690	3,400	8,114	4.9	11.6
Lining...........................cu. yds.	1,630	0	0	0	0
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	81,200	0	0	0	0
White oak lumber in miter-sills and lock-gates, ft. B. M.	8,000	0	0	0	0
Foundation piles, 15 to 30 ft. long......lin. ft.	183,190	22,553	57,315	12.3	31.3
Mooring piles, 20 ft. long................No.	20	0	0	0	0
Wooden sheet-piling................ft. B. M.	154,730	0	151,433	0	97.9
Second-class concrete................cu. yds.	32,541	7,091	11,212	21.8	34.4
Reinforced concrete..................cu. yds.	96	0	0	0	0
First-class masonry bridge coping.....cu. yds.	6	0	0	0	0
Second-class riprap..................cu. yds.	2,754	0	1,004	0	36.5
2½-in. wrought iron pipe and specials....lin. ft.	250	0	0	0	0
Structural steel..........................lbs.	757,722	0	296	0	0.4
Metal reinforcement......................lbs.	27,700	0	1,106	0	4
Steel castings...........................lbs.	12,800	0	0	0	0
Iron castings, machined..................lbs.	6,600	0	0	0	0
Wood pavement.......................sq. yds.	144	0	0	0	0
Wooden fence........................lin. ft.	3,370	0	0	0	0
Wrought iron chain.......................lbs.	6,000	0	0	0	0
Sawed lumber in needles............ft. B. M.	18,000	0	0	0	0
Metal in buffer-beams....................lbs.	96,000	0	0	0	0
Metal in lock-valves.....................lbs.	25,000	0	0	0	0
Metal in lock-gates......................lbs.	188,000	0	0	0	0
Pairs of uprights, including bracing ......pair	4	0	0	0	0
Gates " A "...............................No.	4	0	0	0	0
Gates " B "...............................No.	4	0	0	0	0
Cast iron idlers..........................No.	24	0	0	0	0
Bearing shoes.............................No.	8	0	8	0	100
Machinery................................lbs.	25,000	0	0	0	0
Coffer-dam, pumping, bailing and draining, lump sum	$12,000	0	$3,600	0	30
Removal of bridge superstructure...lump sum	$200	0	$150	0	75
Maintaining highway traffic........lump sum	$1,500	0	$1,275	0	85
Steel sheet-piling, first-class............sq. ft.	46,000	24,160	45,990	52.5	100
Steel sheet-piling, second-class..........sq. ft.	1,520	0	0	0	1
Cutting off steel sheet-piling...........lin. ft.	950	0	0	0	0
Storing steel sheet-piling...............sq. ft.	10,250	0	0	0	0
Deduct — Removing old buildings . .lump sum	$250	0	$150	0	60
Deduct — Sheeting and bracing reused, ft. B. M.	....	0	1,620	0	0
Gross estimate............................	$842,688.52	$107,960.26	$842,688.52	12.8	Finished.

Engineer's estimate, $1,367,583; contract price, as affected by alterations Nos. 1 to 6, inclusive, $842,688.52.

Contract No. 5-A.

N. R. McLeud, Leveler, in charge of construction.

This contract was awarded to James Stewart & Co. of New York city, on January 20, 1912. The length of the contract is 2.44 miles, extending from Sta. 5073, near Mosquito Point bridge over the Seneca river, to Sta. 5202 + 62.89, near Fox Ridge. Included in this contract are concrete substructures for Howland's island and Mosquito Point bridges and a retention dam at Owasco creek outlet.

This contract has been modified by an alteration as follows:

Alteration No. 1, approved by Canal Board November 26, 1912, changes location of Owasco creek dam to avoid damage to bridge; provides additional sheeting and bracing for bridge abutments (soft material encountered), and weep holes in bridge abutments to reduce pressure.

This contract was completed in January, 1913.

The following table shows a summary of work done on this contract:

ITEMS OF WORK.	Preliminary estimate, as affected by alteration No. 1.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
All excavation.....cu. yds.	206,280	35,876	203,908	17.4	98.9
Sheeting and bracing.....ft. B. M.	19,430	16,216	19,216	83.5	98.9
Forming embankment.....cu. yds.	9,950	9,026	10,094	90.6	101.4
Lining.....cu. yds.	240	220	220	91.7	91.7
Sawed lumber, hemlock.....ft. B. M.	87,000	74,058	74,058	85.1	85.1
Round timber in cribs.....lin. ft.	6,400	5,388	5,388	84.2	84.2
Stone filling in cribs.....cu. yds.	1,200	1,022.6	1,022.6	85.2	85.2
Foundation piles.....lin. ft.	5,900	560	2,880	9.5	49
Wooden sheet-piling.....ft. B. M.	5,000	0	0	0	0
Steel sheet-piling.....sq. ft.	4,700	312	4,560	6.6	97
Second-class concrete.....cu. yds.	1,380	1,119.3	1,319.3	81.1	95.6
First-class masonry bridge coping.....cu. yds.	1.4	1.3	1.3	92.9	92.9
Third-class riprap.....cu. yds.	1,940	1,462.6	1,718.6	75.4	88.6
Wooden fence.....lin. ft.	1,480	1,016	1,016	68.6	68.6
Maintaining traffic.....lump sum	$550	$275	$550	50	100
Coffer-dam, pumping, bailing and draining, lump sum	$2,200	$550	$2,200	25	100
Supporting highway bridge at Mosquito Point, lump sum	$2,500	$1,000	$2,500	40	100
Gross estimate.....	$326,902.30	$79,360.83	$319,350.83	24.3	97.7

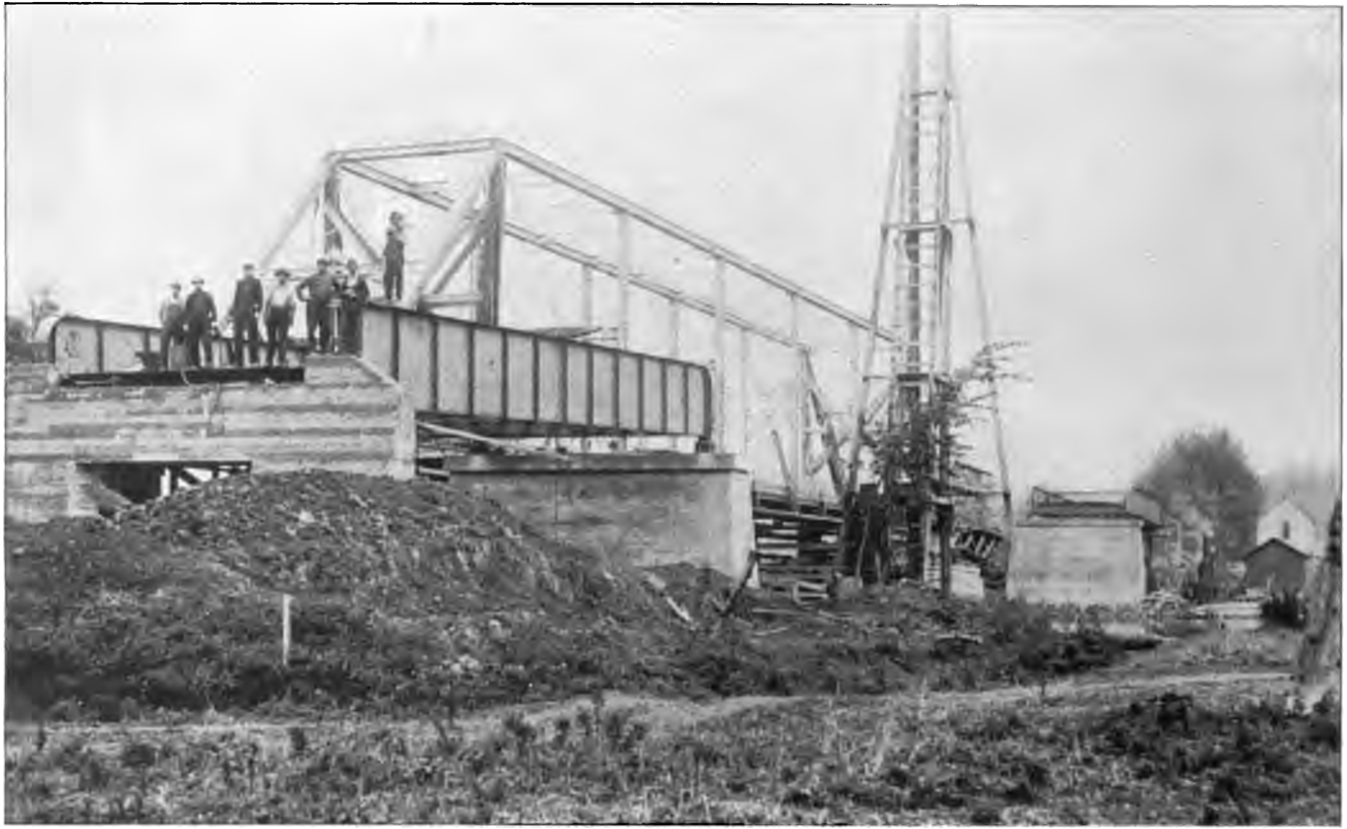
Engineer's estimate, $395,285; contract price as affected by alteration No. 1, $326,902.30.

Contract No. 22-A.

William J. Durkan, Assistant Engineer, in charge of construction.

This contract provides for a new substructure, approach spans and approaches for a bridge over the Barge canal at Weedsport, at Sta. 4819 + 60.

This contract became necessary on account of the failure, due to settlement, of the north abutment of the bridge after its completion under contract No. 22.



BARGE CANAL, CONTRACT NO. 22-A.
Erecting bridge at Weedsport.

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The following table shows the amount of the final estimate paid to the contractors, under the emergency contract with the John Eichleay, Jr., Co. for safeguarding the superstructure of this bridge, after the failure in November, 1911:

CONTRACTOR.	Resolution of Canal Board.	Total estimate of work done.	Total payment.
J. Eichleay, Jr., Co.	Dec. 13, 1911	$12,446 79	$12,446 79

Contract No. 22-A was awarded to Lupfer & Remick, August 8, 1912. Work was started the following December, but was suspended shortly afterward, on account of high water, and was not again resumed until May, 1913. Since that date the new concrete substructure has been finished, the new steel approach spans have been erected and riveted, the embankment in approaches is about 80 per cent completed and preparation is being made to move the existing superstructure to its new location.

This contract has been modified by an alteration as follows:

Alteration No. 1, approved by Canal Board November 26, 1912, changes location of Weedsport bridge to facilitate construction.

The following is a summary of items on contract No. 22-A to September 30, 1913:

ITEMS OF WORK.	Preliminary estimate, as affected by alteration No. 1.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation . . . cu. yds.	5,000	3,177	3,177	63.5	63.5
Lining . . . cu. yds.	270	0	0	0	0
Treated yellow pine sawed lumber . . . ft B. M.	17,000	0	0	0	0
Furnishing and delivering foundation piles.* lin. ft.	6,000	6,650	6,650	110 8	110.8
Driving foundation piles* . . . lin. ft.	7,000	7,715	7,715	110 2	110 2
Second-class concrete . . . cu. yds.	720	670	670	93 1	93.1
Structural steel . . . lbs.	129,000	119,367	119,367	92 5	92 5
Maintaining highway traffic . . . lump sum	0	0	0	0	0
Coffer-dams, pumping, bailing and draining. lump sum	$3,600	$3,600	0 $3,600	100	100
Wooden fence . . . lin. ft.	256	0	0	0	0
Maintaining highway traffic, alteration No. 1. lump sum	$2,600	$520	$520	20	20
Gross estimate . . .	$27,099 20	$21,630	$21,630	80	80

Engineer's estimate, $24,916; contract price, $27,099.20.

* On account of the condition of the foundations, extra piles were needed.

Contract No. 22.

William J. Durkan, Assistant Engineer, in charge of construction.

This contract is for constructing new highway bridges and raising existing highway bridges over the Erie canal between Cold Spring and Free bridge, constructing the necessary new substructures and constructing new bridges over the State ditch and Bonta's bridge. The contract was awarded to M. Fitzgerald on September 14, 1910.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by Canal Board April 26, 1911, raises end of Free bridge to improve grade.

Alteration No. 2, approved by the Canal Board April 24, 1912, changes abutments of Free, Bonta's and Jordan bridges to obtain better foundations; lengthens span of State ditch bridge to reduce cost of abutments; strengthens back post of Cold Spring bridge and provides for maintaining highway traffic at State ditch bridge, not originally provided.

Alteration No. 3, approved by the Canal Board June 24, 1913, changes width of south approach of Cold Spring bridge to correspond with highway improvement.

Alteration No. 4, approved by Canal Board August 19, 1913, improves alignment of east approach of State ditch bridge.

At Free bridge the new north concrete abutment has been finished, the embankment in both approaches has been completed, lining has been placed and guard fences have been erected on both approaches. All work on this structure is now complete.

At Bonta's bridge the main portion of the south abutment is finished and work is progressing on the east wing. The new steel superstructure is finished and the flooring laid.

At Jordan bridge a concrete curtain wall was built on the pier to support the end floor beams.

At State ditch bridge a temporary bridge was built to maintain traffic. The new steel superstructure has been erected and bolted and a temporary floor laid, to allow traffic to cross over the new structure.

The following table gives a summary of work done during the year and the total completed to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1, 2, 3 and 4.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation . . . . cu. yds.	35,790	4,762	21,618	13.3	60.5
Forming embankment for bridge approaches, cu. yds.	22,820	4,100	16,101	18	70.6
Lining . . . . cu. yds.	1,950	449	492	23	25.2
Sawed lumber, yellow pine . . . . ft. B. M.	61,000	26,000	35,000	42.6	57.4
Foundation piles, 17 to 20 ft. long . . . . . . lin. ft.	18,900	2,244	6,079	11.9	32.2
Second-class concrete . . . . cu. yds.	4,600	1,121	2,633	24.4	57.2
Reinforced concrete . . . . cu. yds.	235	22	237	8	100.7
First-class masonry bridge coping . . . . . cu. yds.	11	0	0	0	0
Third-class stone paving . . . . sq. yds.	580	0	0	0	0
Third-class riprap . . . . cu. yds.	105	0	106	0	100.9
Structural steel . . . . lbs.	550,600	322,021	480,044	53.5	87.2
Metal reinforcement . . . . lbs.	30,200	2,212	23,857	7.3	95.5
Wooden pavement . . . . sq. yds.	0	0	0	0	0
Wooden fence . . . . lin. ft.	3,930	1,493	1,493	38	38
Coffer-dams, pumping, bailing and draining, lump sum	$15,500	$5,425	$5,425	35	35
Resetting old fence* . . . . lin. ft.	519	549	549	100	100
Removing old bridge superstructure . lump sum	$1,000	$500	$1,000	50	100
Maintaining highway traffic . . . . lump sum	$3,500	$525	$1,715	15	49
Raising bridge superstructure . . . . . . lump sum	$3,500	$665	$2,905	19	83
Coffer-dam, pumping, bailing and draining of north abutment, Free bridge . . . . lump sum	$800	$800	$800	100	100
Raising north end of north span of Free bridge, lump sum	$400	$400	$400	100	100
Maintaining traffic, north end of Free bridge, lump sum	$300	0	0	0	0
Maintaining traffic at State ditch bridge, lump sum	$1,000	$170	$420	17	42
Gross estimate	$127,936.80	$33,300	$78,800	20.9	61.6

Engineer's estimate, $107,126; contract price, $127,936.80.

* This item was increased to 549 lin. ft. by resolution of Canal Board, dated September 9, 1913.

Contract No. 12, Section No. 7.

N. R. McLoud, Leveler, in charge of construction.

Contract No. 12 extends from deep water in Oneida lake to Mosquito Point. The total length of the contract is 43.75 miles. That portion extending from Oneida lake to Baldwinsville is in Residency No. 6. The portion from Baldwinsville to Mosquito Point is in Residency No. 7, and is 21.25 miles in length. This contract was let to the Stewart-Kerbaugh-Shanley Co. of New York city on September 23, 1907, and was assigned to James Stewart & Co. on August 25, 1910.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by the Canal Board June 11, 1908, changes order of work, location of spoil banks, etc., to expedite work; changes lock-gates and details of lock construction to conform to standard.

Alteration No. 3, approved by the Canal Board April 27, 1909, flattens side slopes on account of soft material; eliminates wash wall; changes bridge abutments on account of flatter slopes.

Alteration No. 4, approved by the Canal Board June 30, 1910, fixes side slopes in Brewerton cut; provides for depositing spoil in Cross lake; changes specifications for rate of progress to expedite work and for extending contract period on account of flattening slopes.

Alteration No. 6, approved by the Canal Board November 16, 1910, permits rock spoil in deep water of Seneca river to expedite work.

Alteration No. 7, approved by the Canal Board March 22, 1911, changes plans for Brewerton lock on account of hard material; changes snubbing posts; provides electric conduits; provides riprap in front of approach walls to prevent scour; changes rate of progress, and permits spoil in deep water to expedite work.

Alteration No. 8, approved by the Canal Board August 30, 1911, changes plans for lock No. 23, on account of condition of foundation.

Alteration No. 10, approved by the Canal Board November 1, 1911, changes plans for wheel pits and power culvert to conform to present standards.

Alteration No. 11, approved by the Canal Board July 11, 1912, changes side slopes, location of spoil banks and eliminates wash wall on account of soft material.

Alteration No. 12, approved by the Canal Board November 12, 1912, provides sluice-gate at Caughdenoy lock to regulate flood height.

Alteration No. 13, approved by the Canal Board January 14, 1913, eliminates pile docking below lock No. 23 (believed unnecessary).

During the fall of 1912, dipper dredge No. 5 worked in hard material at Hickory island and also cleaning up prism cut between Mosquito Point and Free bridge. Hydraulic dredge No. 1 and dipper dredge No. 4 worked at Maloney's cut. Dredge No. 1. started for section No. 6 on November 22, 1912. Dredge No. 4 was closed down December 6, 1912, and dredge No. 5 was closed down on January 11, 1913.

Work was again resumed on April 14, 1913, when dredge No. 1 started at Bonta's bridge and worked westward until May 15. She was then moved up to the west end of the contract and worked eastward, cleaning up the prism cut. On May 8, 1913, dredge No. 5 started working about 400 feet east of Weedsport bridge, finishing the cut up to the bridge on May 31. She was then moved to Sta. 4710 and worked eastward to a point about 900 feet east of Bonta's bridge, which was accomplished on August 7. A small amount of excavation was then made between Stas. 4656 and 4650, after which she was moved to a point about 500 feet west of Jordan bridge and finished the excavation down to that bridge on August 12. She was then moved down to Maloney's cut, where she worked until August 31, and was then taken to section No. 6. Dredge No. 4 worked at Maloney's cut from April 14, until June 15, 1913, and was then taken to section No. 6.

The prism had been swept from Mosquito Point to Cross lake, a distance of 10 miles, showing a clear channel to at least elevation 362.0, or canal bottom, for the entire distance.

The following table of the whole contract shows the percentage of work done during the fiscal year and to date, as affected by all alterations:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1, 3, 4, 6, 7, 8, 10, 11, 12 and 13.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... lump sum	$8,800	$1,944 80	$6,661 60	22.1	75.7
Grubbing .... cu. yds.	12,120	0	8,036	0	66.3
All excavation, division No. 1 .... cu. yds.	1,190,000	21,955	1,072,036	1.8	90.1
All excavation, division No. 2 .... cu. yds.	700,000	0	615,916	0	88
All excavation, division No. 3 .... cu. yds.	2,453,400	170,132	1,856,328	6.9	75.7
All excavation, division No. 4 .... cu. yds.	3,383,700	698,025	2,614,287	20.7	77.3
Sheeting and bracing .... ft. B. M.	119,000	3,000	31,000	2.5	26.1
Forming embankment .... cu. yds.	131,900	20,334	86,965	15.4	66
Lining .... cu. yds.	1,330	0	490	0	36.8
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	443,300	2,000	38,000	0.5	8.6
White oak lumber in miter-sills and gates, ft. B. M.	8,000	5,040	6,800	63	86.1
Sawed lumber, white oak .... ft. B. M.	74,020	800	800	0.1	0.1
Sawed lumber, creosoted, yellow pine or Douglas fir .... ft. B.M.	16,000	0	0	0	0
Round timber in cribs .... lin. ft.	103,400	0	0	0	0
Stone filling .... cu. yds.	11,400	0	0	0	0
Foundation piles, 12 ft. long .... No.	39	0	33	0	84.1
Foundation piles, 20 ft. long .... No.	180	0	71	0	39.4
Foundation piles, 25 ft. long* .... No.	0	0	16	0	0
Foundation piles, 30 ft. long* .... No.	0	0	1	0	0
Mooring piles, 16 ft. long .... No.	20	0	0	0	0

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* Found necessary to use longer piles than called for in the preliminary estimate.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1, 3, 4, 6, 7, 8, 10, 11, 12 and 13.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Mooring piles, 25 ft. long .... No	51	0	0	0	0
Docking piles, 25 ft. long .... No.	1,853	0	0	0	0
Second-class concrete .... cu. yds	32,806	1,956	21,517	6	65 6
Reinforced concrete† .... cu. yds	497	0	849	0	170 9
First-class masonry bridge coping. .... cu. yds	10	0	7	0	70
Wash wall .... cu. yds	8,542	97	147	1.1	1.7
Cobblestone paving .... sq. yds	120	0	30	0	25
Third-class riprap .... cu. yds	1,010	151	261	14.9	25.8
Structural steel .... lbs	653,500	4,188	570,535	0.6	87
Metal in lock-gates .... lbs	200,000	25,482	187,823	12 7	93.9
Metal in needle-dams .... lbs.	80,000	3,435	55,390	4.3	69 2
Metal in lock-valves .... lbs	26,000	4,572	25,923	17 5	99.7
Metal reinforcement .... lbs	81,400	3,763	66,834	4.6	82.1
Iron castings, plain .... lbs.	26,800	1,014	6,760	3.9	25.2
Iron castings, machined .... lbs.	22,500	0	20,412	0	90 7
Wooden fence .... lin. ft.	3,400	0	0	0	0
Fender fastenings .... No.	836	0	0	0	0
Removing old tree dam at Oak Orchard, lump sum	$1,100	$990	$990	90	90
Raising bridge superstructure .... lump sum	$1,100	0	$1,100	0	100
Maintaining highway traffic .... lump sum	$6,600	$1,933 20	$5,755.20	30.2	87.2
Deduct for buildings .... lump sum	$2,700	0	0	......	......
Deduct for bridge superstructures.. lump sum	$1,350	0	$1,350	0	100
Sluice-gate, complete .... lump sum	$15,000	$1,200	$1,200	8	8
Deduct for sheeting and bracing reused, ft. B. M.	....	0	13,600	....	0
Gross estimate	$3,563,331 49	$235,060.00	$2,833,570.00	6.6	79

Engineer's estimate, $3,032,560; contract price, as affected by alterations, $3,563,331.49.
† Increase of 540 cu. yds. of reinforced concrete authorized by resolution of Canal Board, dated May 26, 1908.

Contract No. 102.

N. R. McLoud, Leveler, in charge of construction.

This contract is for the construction of a new steel superstructure for the Howland's island highway bridge over the Erie canal on contract No. 5-A at Sta. 5151 + 78.5.

The contract was awarded to Lupfer & Remick of Buffalo, N. Y., on February 20, 1913.

Work has not been started on this contract.

First Resident Engineer Guy Moulton reports:

Contract No. 57.

This contract extends from the Seneca river to Onondaga lake, a distance of 0.86 mile. The work was let to the New York State Dredging Corporation. W. R. Smith was placed in charge of the field work. Actual work was started December 10,

1912. The excavation has been done with an hydraulic dredge and is practically completed. The following table shows the amount of work done to date:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.................. acres	20	18	18	0	90
Excavation............. cu. yds.	200,700	189,446	189,446	0	94
Second-class riprap...... cu. yds.	3,700	2,775	2,775	0	75
Fourth-class riprap.... cu. yds.	8,000	0	0	0	0
Maintaining highway traffic, lump sum	1	30%	30%	0	30

Roads Adjacent to Peter Scott Swamp.

Owing to the raising of the dam across the Oswego river at Phoenix, it was deemed necessary to raise the roads along the Oneida river adjacent to Peter Scott swamp. The elevation of the crest of Phoenix dam is 363.00. It was thought advisable to raise all roads that were below elevation 367.00, which could possibly be effected by the dam, to elevation 369.00. Accordingly surveys were made and plans and estimate prepared for raising about 3.25 miles of road. The work has been advertised.

OSWEGO CANAL, RESIDENCY NO. 1.

Resident Engineer Theron M. Ripley reports:

The field work along Ox creek, which is mentioned in my previous report, was completed on January 20, 1913, and during the spring the field notes were reduced and 51 appropriation maps prepared, covering 1,016 acres of land, which are below the maximum navigable stage of the pool between Fulton and Phoenix. There was also surveyed and appropriation maps made for 13 parcels, which were used for borrow pit purposes or change in location of highways or abandonment of highways, because of the changed conditions along this creek, necessitated by the raising of the upper dam at Fulton.

During the spring of 1913 in the latter part of March and first of April the volume of discharge in the Oswego river was greater than it had been for several years. The upper dam at Fulton under the original plans for contract No. 10-A was to have been raised five feet. After this contract was let an alteration was made thereto, which covered the installation of six Taintor gates in the spillway of this dam. These gates had not been completed prior to high water and were still in the hands of the contractor. Consequently the entire flow of the river had to pass over the shortened dam with a consequent greater elevation in the pool above. Under Barge canal contract No. 78 and the highway adjacent a dyke had been built along the river for a distance of about two miles, beginning at a point about one-third of a mile above the said dam and extending southerly therefrom. Owing to the excessive rains, the extreme height of the pool level and the waves caused by the wind blowing almost continuously during this high water period, some of the stone protection along the dyke was damaged and the raised highway, not protected by stone work, was partially washed out. To repair this damage plans and estimates were prepared in this office and under Chapter 515 of the Laws of 1913 a contract was let, amounting to $10,995.00.

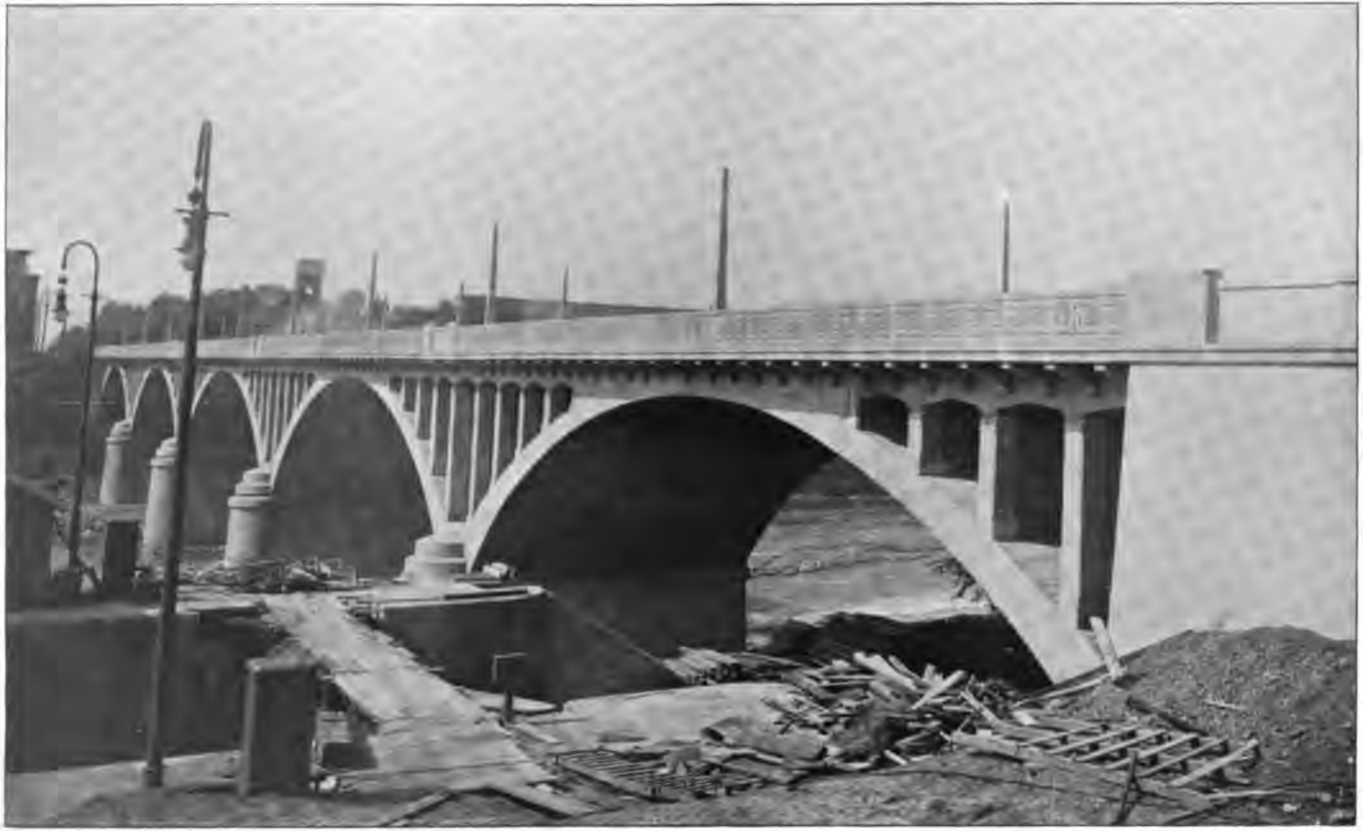
Aside from the usual routine work the residency work has further consisted in preparing plans and estimates for several alterations upon contracts Nos. 10-A, 10-B and 39.

Since the beginning of Barge canal construction the work on this residency has been divided as follows:

Contracts Nos. 10, 10-A, 10-B, 33, 39, 53, 78, 80, 85, 90, 90-A, 93, 100, 103 and 104, highway adjacent to contract No. 78, Ox creek highways, and repairs to dike and highway south of Fulton.

For general description of contracts Nos. 10, 33, 39, 53, 78, 80, 85 and 90, highway adjacent to contract No. 78 and Ox creek highways, see Annual Report for 1911. For general description of contracts Nos. 10-A, 10-B, 90-A and 104, see Annual Report for 1912.

Contract No. 93. Power plants, electrical equipment and machinery for operating and lighting Erie canal locks Nos. 20, 21, 22, 23 and 25 and junction lock at New London; also Oswego canal locks Nos. 3, 5 and 6.



Barge Canal, Contract No. 104.

Concrete arch bridge at Broadway, Fulton, spanning the Oswego canal and the Oswego river at the foot of lock No. 2. The State's portion is the arch in the foreground.

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Contract No. 100. For constructing highway bridges at Hinmansville, Belgium and Long Branch, within contracts Nos. 39, 12 and 57, respectively.

Contract No. 103. For constructing a bridge over the Oswego river and Oswego canal at Lock street, Phoenix.

Dike and Highway Repairs. For repairs to the dike south of the city of Fulton and to the raised highway, which is a continuation thereof.

The total amount of work done in this residency during the year is shown in the following tables:

Work under Contract prior to October 1, 1912.

CONTRACT.	Value of work under contract.	Value of work done to October 1, 1912.
Contract No. 10	$1,111,964 57	$668,360 00 Relet
Contract No. 10-A	174,513 90	88,600 00
Contract No. 10-B	487,545 00	76,240 00
Contract No. 33	24,961 03	24,961 03 Final
Contract No. 39	1,048,674 00	230,720 00
Contract No. 53	167,585 00	164,575 52 Final
Contract No. 78	49,025 95	50,068 19 Final
Contract No. 80	117,390 64	110,886 34 Final
Contract No. 85	13,173 00	12,010 00
Contract No. 90	32,719 80	29,850 00
Contract No. 90-A	34,950 05	980 00
Contract No. 104	39,370 00	590 00
Highway adjacent to contract 78	15,419 90	16,733 56 Final
Ox creek highways	73,353 50	3,560 00
Totals	$3,390,646 34	$1,478,134 64

Work under Contract prior to October 1, 1913.

CONTRACT.	Value of work under contract.	Value of work done to October 1, 1913.
Contract No. 10	$1,111,964 57	$668,360 00 Relet
Contract No. 10-A	174,513 90	158,800 00
Contract No. 10-B	516,336 05	465,620 00
Contract No. 33	24,961 03	24,961 03 Final
Contract No. 39	1,048,674 00	390,120 00
Contract No. 53	167,585 00	164,575 52 Final
Contract No. 78	49,025 95	50,068 19 Final
Contract No. 80	117,390 64	110,886 34 Final
Contract No. 85	13,173 00	12,097 81 Final
Contract No. 90	32,719 80	30,471 24 Final
Contract No. 90-A	34,950 05	15,740 00
Contract No. 93	35,299 24	0
Contract No. 100	65,121 16	0
Contract No. 103	197,995 00	20,610 00
Contract No. 104	39,370 00	34,190 00
Highway adjacent to contract 78	15,419 90	16,733 56 Final
Ox creek highways	73,353 50	62,150 00
Repairs to dike and highway	10,995 00	8,170 00
Totals	$3,728,847 79	$2,233,553 69

Contract No. 10.

This contract has been superseded by contracts Nos. 10-A and 10-B, but the final estimate for same has not been sent in.

Contract No. 10-A.

George C. Hannon, Leveler, in charge of contract. The T. A. Gillespie Co., 50 Church St., New York city, contractors.

For detailed description of this contract see State Engineer's Annual Report for the year 1912, Vol. I, page 177.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by Canal Board March 11, 1912, changes plans for dikes and upper dam at Fulton to avoid work now believed unnecessary and to improve construction and decrease cost of dam.

Alteration No. 2, approved by Canal Board March 20, 1912, provides retaining walls on east side above lock No. 2 to avoid appropriation of property.

Alteration No. 3, approved by Canal Board July 30, 1912, provides Taintor gates in upper dam to regulate water-surface and reduce flood damage.

The work done during the year consists of finishing the Taintor gates and dredging the prism where the same cuts through the old berme bank between original canal and the river. The dredging is being done by an improvised machine, the dipper of which is a Bishop bucket. So far as known this is the first time this bucket has ever been used on a dredge. This contract was let December 14, 1911. Work was started January 11, 1912. The original time limit expired September 1, 1912. This time was necessarily extended, owing to the large increase of work due to the Taintor gates under alteration No. 3. The following table gives the summary of work done:

ITEMS OF WORK.		Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Grubbing	cu. yds.	1,020	0	197	0	1
Excavation from spoil bank	cu. yds.	9,070	0	1,760	0	19
All other excavation	cu. yds.	38,830	3,318	31,311	8.5	80
Forming embankment	cu. yds.	25,220	0	21,011	0	83
Hemlock, sawed lumber	ft. B. M.	25,000	0	18,306	0	73
Spruce, sawed lumber	ft. B. M.	21,500	1,535	19,277	7.3	89

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
White oak, sawed lumber .... ft. B. M.	2,100	1,230	2,064	60.3	98.3
First-class concrete .... cu. yds.	3,030	1,926	2,937	63.5	96.9
Second-class concrete .... cu. yds.	730	0	592	0	81
Finishing concrete surfaces .... sq. ft.	3,500	0	3,150	0	90
Repairing tops of concrete walls .... cu. ft.	250	0	145	0	58
Wash wall .... cu. yds.	1,300	0	1,181	0	91
Stone filling .... cu. yds.	400	83	303	21	77
Iron castings, plain .... lbs.	5,300	0	5,032	0	95
Structural steel .... lbs.	6,780	492	5,869	7.5	86.5
Metal reinforcement .... lbs.	11,800	1,280	1,230	10.8	10.8
¾-in. log chain .... lbs.	1,900	0	2,146	0	113
30-in. concrete drain .... lin. ft.	25	0	18	0	72
Trenching and backfilling for 30-in. concrete drain .... lin. ft.	25	0	18	0	72
Removing old plant debris, etc ..... lump sum	1	10%	100%	10	100
Metal in Taintor gates .... lbs.	335,700	320,630	320,630	95.5	95.5
Coffer-dams, pumping, bailing and draining, lump sum	1	45%	95%	45	95
Sawed lumber, yellow pine .... ft. B. M.	24,000	23,040	23,040	96	96

Engineer's original estimate, $103,058; plus alterations Nos. 1, 2 and 3, $67,301.40; total, $170,362.40.
Contractor's original price, $106,738; plus alterations Nos. 1, 2 and 3, $67,775.90; total, $174,513.90.
Total work done during year, 40.1 per cent of contract price.
Total work done to date, 90.9 per cent of contract price.

Contract No. 10-B.

H. H. Brown, Assistant Engineer, in charge. Oswego Construction Co., Inc., Fulton, N. Y., contractors.

For detailed description of this contract see State Engineer's Annual Report for 1912, Vol. 1, page 178.

Two alterations have been placed on this contract, the largest of which, alteration No. 2, increased the contract by $28,791.05, but owing to the decrease of $7,750 under alteration No. 1, the net increase to the contract because of alterations is $25,041.

During the year lock No. 3 was built, with the exception of the completion of the gates and valves, and all other work was pushed to such an extent that the contract should be practically completed on or before December 1, 1913. The excavation which could not be handled economically by steam-shovel and all of the concrete, including the sectional forms therefor, were handled by two 70-ton McMyler hoists with 70-foot booms. These machines were designed especially for this work, the booms being of such length that a machine resting in the bottom of lock No. 3 (which has side walls 45.5 feet high in the clear) could be raised over the forms at the full height of the wall. This contract was let March 4, 1912. Work was started April 6, 1912. The time limit expires December 1, 1913.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by Canal Board July 30, 1912, substitutes line drilling for channeling to expedite work and reduce cost.

Alteration No. 2, approved by Canal Board September 10, 1912, provides for installing gates, valves, needle-beams, etc., at lock No. 3 (furnished under contract No. 33).

The following table gives the summary of the work done:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
All excavation .... cu. yds.	88,140	48,650	82,205	55.2	93.3
Sheeting and bracing .... ft. B. M.	10,000	6,050	6,050	60.5	60.5
Channeling .... sq. ft	6,250	219	6,515	3.5	104.2
Forming embankment .... cu. yds	23,600	15,239	15,709	64.6	66.5
Ballast .... cu. yds.	2,200	68	68	3	3
Spruce, sawed lumber .... ft. B. M.	70,000	44,000	44,000	62.8	62.8
White oak, sawed lumber .... ft. B. M.	9,100	2,860	2,860	31.4	31.4
First-class concrete .... cu. yds.	600	110	110	18.3	18.3
Second-class concrete .... cu. yds.	35,701	34,795	35,214	97.4	98.6
Finishing concrete surfaces .... sq. ft.	8,000	2,570	2,570	32.1	32.1
Repairing tops of concrete walls .... cu. ft.	2,000	90	90	4.5	4.5
Stone paving, second-class .... sq. yds.	640	385	385	60.2	60.2
Wash wall .... cu. yds.	295	168	168	56.9	56.9
Steel castings .... lbs.	6,550	6,296	6,296	96.1	96.1
Iron castings, plain .... lbs.	128,600	110,277	110,277	85.7	85.7
Iron castings, machined .... lbs.	40,000	38,654	38,654	96.6	96.6
Structural steel .... lbs.	28,100	27,213	27,613	96.9	98.4
Metal reinforcement .... lbs.	66,835	7,531	9,711	11.3	14.5
Expansion bolts in place .... No.	55	14	14	25.5	25.5
Repairs to one "light hoist" on bulkhead No. 1 lump sum	1	100%	100%	100	100
Repairing second-class riprap .... cu. yds.	85	0	0	0	0
Removing buildings .... lump sum	1	50%	50%	50	50
Clearing up site of contract .... lump sum	1	25%	25%	25	25
Line drilling .... sq. ft.	18,750	6,456	15,680	34.4	83.6
Metal in lock-gates .... lbs.	275,000	232,465	232,465	84.5	84.5
Metal in needle-beams .... lbs.	54,100	43,300	43,300	80	80

Engineer's original estimate, $515,044; plus alterations Nos. 1 and 2, $25,041; total, $540,085.
Contractor's price, $491,295; plus alterations Nos. 1 and 2, $25,041; total, $516,336.
Percentage of work done during year = 75.4.
Percentage of work done to date = 90.2.

Contract No. 33.

For detailed description of this contract see Annual Report for 1911, Vol. I.

There was an alteration made to this contract which eliminated all work not completed. The final estimate was $24,961.03.

Contract No. 39.

For detailed description of this contract see State Engineer's Annual Report for 1911, Vol. I.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by Canal Board April 26, 1911, provides additional spoil area in bed of river to expedite work.

Alteration No. 2, approved by Canal Board April 22, 1913, eliminates excavation at Phoenix bridge to avoid interference with bridge contract.

The work done during the year consisted of dredging the channel north of Hinmansville and drilling and blasting south of Hinmansville. The plant in use consisted of one dipper dredge with a five-yard bucket, two 500-cubic yard and one 250-cubic yard dump scows, two tugs and two coal scows.

A small Thew shovel was moved on the contract just below the Phoenix lock and is working between lock No. 1 and the river. It has removed 3,260 cubic yards.

During the summer the east span of the Hinmansville bridge was moved back, to allow the passage of the dredging fleet, and a ferry maintained. The work was done under a special work order.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.............cu. yds.	1,224,930	192,050	470,030	15.7	38.4

Engineer's estimate, $972,900.
Contractor's price, $1,048,674.40; decrease by alteration No. $888.10; total as affected by alteration, $1,047,786.30.
Percentage of work done during year = 15.2.
Percentage of work done to date = 37.2.

Contract No. 53.

See Annual Report for 1912.

Contract No. 78.

See Annual Report for 1912.

Contract No. 80.

See Annual Report for 1912.

Contract No. 85.

See Annual Report for 1912.

The final estimate for this contract, amounting to $12,097.81, was signed January 27, 1913.

Contract No. 90.

See Annual Report for 1912.

The final estimate for this contract was signed December 30, 1912, the amount on this residency being $30,471.24.

Contract No. 90-A.

H. A. J. Castor, Assistant Engineer, in charge of contract.
Lupfer & Remick, Buffalo, N. Y., contractors.

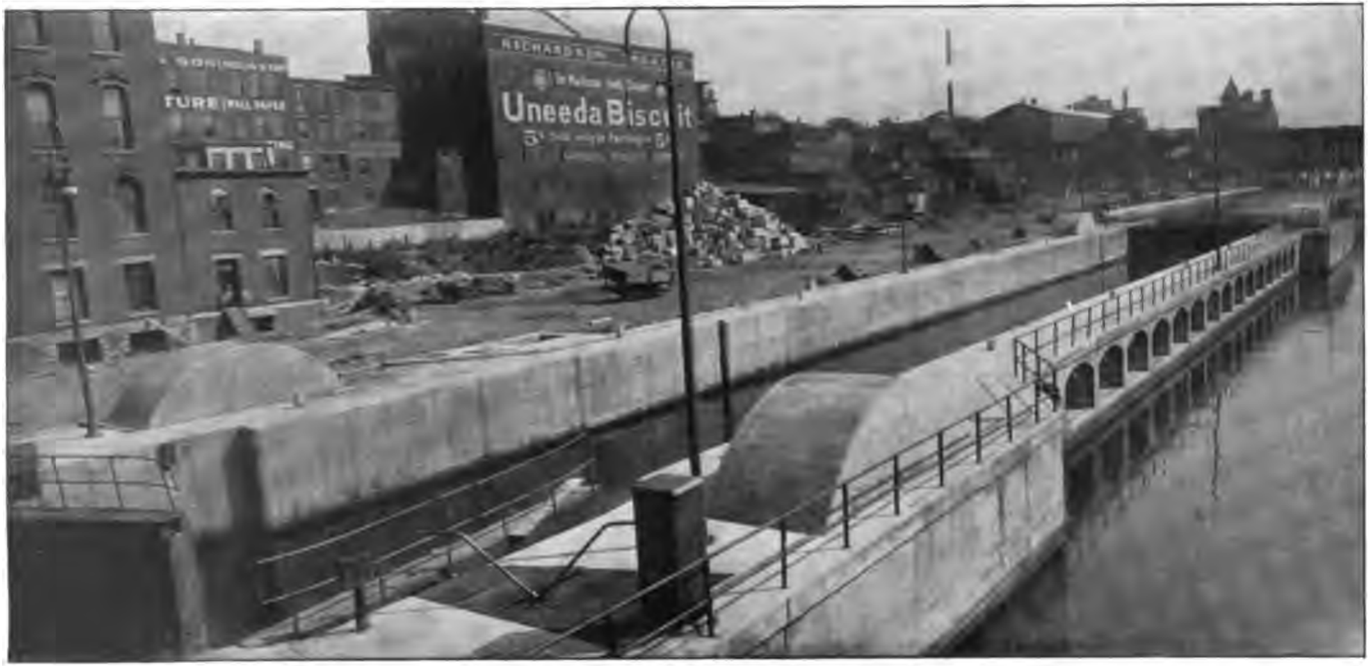
The portion of this contract on this residency consists in building and equipping a substation adjacent to lock No. 1 at Phoenix to supply power for the operation of lock No. 1 and the bascule bridge over the lock; also the construction of a hydro-electric plant at lock No. 2, in Fulton, to supply power for operating and lighting locks Nos. 2 and 3. The power for the bascule leaves in the main bridge over the canal at Lock street also passes through the house at lock No. 1.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate, locks Nos. 1 and 2.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.......................cu. yds.	1,119	171	390	15.2	34.8
Chipping concrete....................cu. ft.	68	33	36	48.5	53
Sheeting and bracing...............ft. B. M.	4,500	2,522	2,522	56	56
Forming embankment...............cu. yds.	1,007	135	135	13.4	13.4
First-class concrete..................cu. yds.	24	23	23	96	96
Second-class concrete............... cu. yds.	*182	107	174	59	95
First-class reinforced concrete........cu. yds.	240	229	229	95	95
Structural steel..........................lbs.	10,145	7,650	7,650	75	75
Metal reinforcement.....................lbs.	20,850	19,800	19,800	95	95
Iron castings, machined.................lbs.	2,775	2,446	2,446	88.5	88.5
Drilling 1½-in. holes..................lin. ft.	3	2	2	66	66
Drilling 3-in. holes....................lin. ft.	20	22	22	110	110
Squares of roofing....................sq. ft.	21.7	21.4	21.4	98.7	98.7
Armored lead-covered conductor..........lbs.	2,000	1,786	1,786	89	89
Painting concrete....................sq. yds.	595	291	291	49	49
Electric equipment, lock No. 1......lump sum	1	40%	40%	40	40
Traveling cranes........................ No.	2	1.7	1.7	85	85
Doors, windows and woodwork...........No.	2	1.6	1.6	80	80
Electric capstans......................No.	2	10% of 1	10% of 1	5	5
Coffer-dams, pumping, bailing and draining lump sum	70%	70%	70%	100	100

* Increase in item second-class concrete, from 137 to 212 cubic yards, for entire contract, by order of Canal Board January 29, 1913.

Engineer's estimate, entire contract, $64,840.
Contractor's price, entire contract, $64,020.20; with addition by Canal Board, $64,920.20.
Contractor's price on this residency, $34,950.05; with addition by Canal Board, $35,490.05.
Percentage of work done during year, 43.0.
Percentage of work done to date, 45.



BARGE CANAL, CONTRACT NO. 35.
General view of the siphon lock, No. 8, at Oswego.

Contract No. 93.

H. A. J. Castor, Assistant Engineer, in charge of contract. MacArthur Bros. Co. & Lord Electric Co., contractors.

The portion of the contract on this residency consists of the electric equipment for lock No. 3.

The contract was let in August, 1913. No work done to October 1, 1913.

Engineer's estimate for entire contract	$393,701.00
Contractors' price for entire contract	379,693.50
Contractors' price on this residency	35,299.24

Contract No. 100.

S. Reswick, Assistant Engineer, in charge of contract. W. J. Burns Co., Syracuse, N. Y., contractors.

This contract was let September 12, 1913, and except for operation of the ferry during September, no work has been done.

Engineer's estimate for entire contract	$181,923.00
Contractor's price for entire contract	179,061.00
Contractor's price on this residency	65,121.16

Contract No. 103.

For constructing a bascule bridge over the Oswego canal and three arch spans of reinforced concrete over the Oswego river at Phoenix. This work joins six arch spans that are under construction by the townships of Lysander and Schroeppel.

A coffer-dam was built to enclose the site but on its failure the work in the prism was put over and work rushed on the land and river pits. In the river pit the excavation has been finished and the concrete work partly completed. In the land pit no concrete has yet been placed.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Chapter 147, Laws of 1903.					
Coffer-dams, pumping, bailing and draining lump sum	1	30%	30%	30	30
Excavation cu. yds.	17,300	3,197	3,197	18.5	18.5
Second-class concrete cu. yds.	1,730	348	348	20.1	20.1

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Second-class reinforced concrete......cu. yds.	1,430	202	202	14.1	14.1
Structural steel..........................lbs.	1,059,000	5,780	5,780	0.5	0.5
Metal reinforcement....................lbs.	97,000	11,638	11,638	12	12
Fiber duct...........................lin. ft.	4,400	517	517	11.7	11.7
Timber crib......................lump sum	1	100%	100%	100	100
Maintenance of navigation.........lump sum	1	40%	40%	40	40
Chapter 792, Laws of 1911.					
Coffer-dams, pumping, bailing and draining lump sum	1	80%	80%	80	80
Excavation.........................cu. yds.	100	99	99	99	99
Second-class concrete................cu. yds.	470	305	305	64.9	64.9
Structural steel.........................lbs.	72,000	1,300	1,300	1.8	1.8

Engineer's estimate, $185,655. Contractor's price, $197,995.
Percentage of work done during year, 10.4.
Percentage of work done to date, 10.4.

Contract No. 104.

M. D. Ewell, Assistant Engineer, in charge of contract. R. B. Murdock, Crown Point, N. Y., contractor.

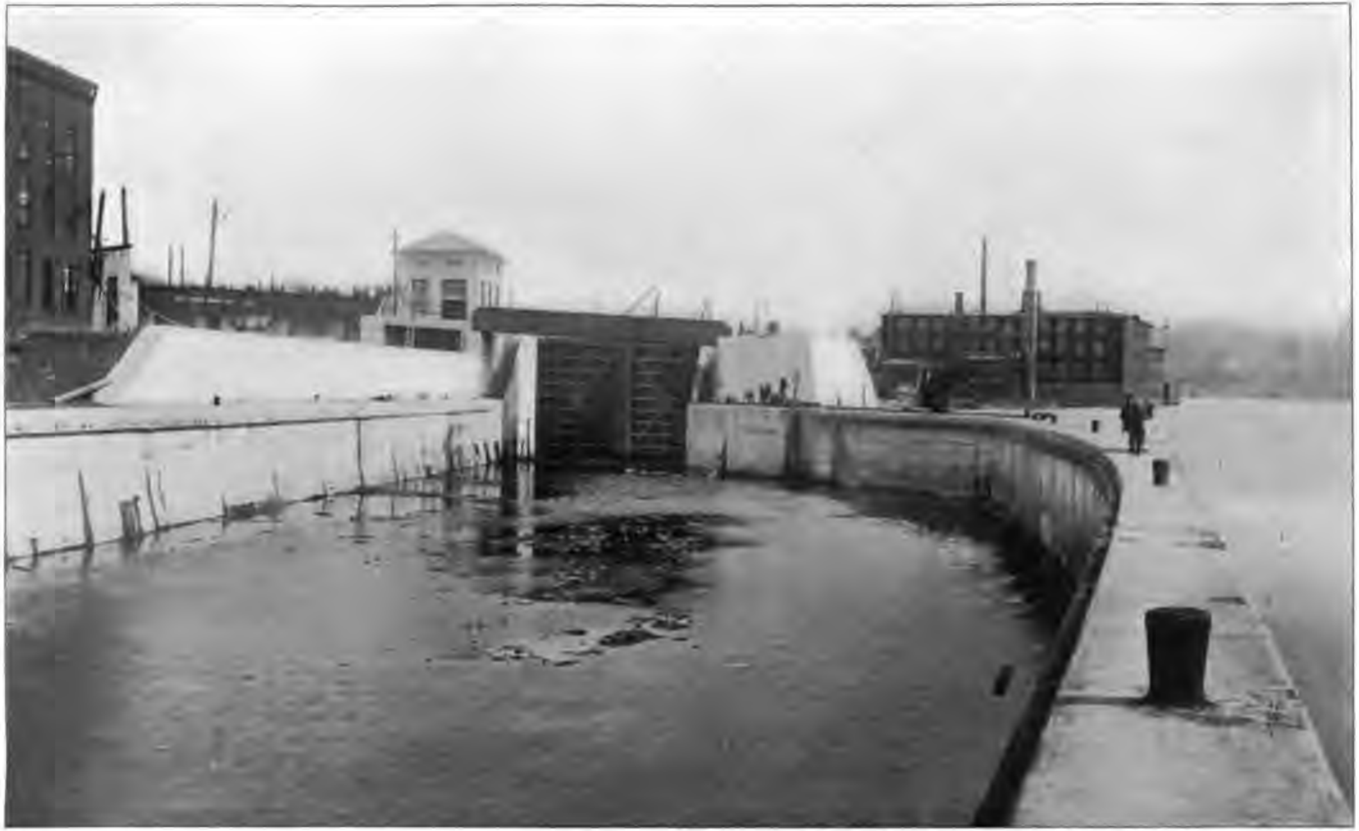
For detailed description of this contract see Annual Report for 1912.

During the year this work was pushed and is very near completion. The arch ring and abutment were built, the embankment made and roadway completed, except for the brick pavement.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.........................cu. yds.	5,300	3,103	3,467	58.5	65.5
Forming embankment...............cu. yds.	5,000	3,194	3,194	64	64
Second-class concrete...............cu. yds.	*720	923	923	112.8	112.8
First-class reinforced concrete........cu. yds.	1,470	1,367	1,367	92.5	92.5
Structural steel.........................lbs.	104,000	94,456	94,456	90.5	90.5
Metal reinforcement....................lbs.	32,000	29,759	29,759	93	93
Miscellaneous cast iron and steel.........lbs.	2,000	452	452	22.5	22.5
Brick pavement......................sq. yds.	1,650	397	397	24	24
Parapet walls........................lin. ft.	400	388	388	97	97
Wooden fence........................lin. ft.	400	320	320	80	80
Lamp posts and trolley poles.............No.	8	7	7	87.5	87.5
Waterproofing.......................sq. yds.	800	503	503	63	63
Furnishing and laying conduits, lin. ft., lump sum	820	94%	94%	94	94
Maintaining highway traffic........lump sum	1	100%	100%	100	100
Deduct for existing bridge superstructure, lump sum	1	100%	100%	100	100

* Increase in second-class concrete from 720 to 930 cubic yards by order of Canal Board, September 9, 1913.
Engineer's estimate, $45,580. Contractor's price, $39,370.
Percentage of work done during year, 85.5.
Percentage of work done to date, 87.



BARGE CANAL, CONTRACT NO. 35.
View of completed prism at Oswego, looking toward lock No. 7.

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Highway Adjacent to Contract No. 78.

See Annual Report for 1912.

Ox Creek Highways.

S. Reswick, Assistant Engineer, in charge of contract. James Stewart & Co., Inc., New York city, contractor.

For general description of this contract see Annual Report for 1911, Vol. I, page 186.

During the year this work was practically completed, roads Nos. 1, 2, 3, 4, 5 and 6 and the various bridges being raised and a number of culverts built.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... lump sum	1	100%	100%	100	100
Grubbing .... cu. yds.	4,400	1,992	2,213	45.3	50.3
Excavation .... cu. yds.	55,200	43,810	48,205	79.4	87.3
Sheeting and bracing .... ft. B. M.	3,000	2,000	2,000	66.7	66.7
Embankment .... cu. yds.	49,200	33,892	37,104	68.9	75.4
Lining .... cu. yds.	1,580	1,445	1,445	91.5	91.5
Second-class concrete .... cu. yds.	1,400	1,212	1,234	86.6	88.2
Cobblestone paving .... sq. yds.	26	26	26	100	100
Fourth-class riprap .... cu. yds.	850	213	213	25.1	25.1
15-inch cast iron pipe .... lbs.	8,000	8,140	8,140	101.7	101.7
Metal reinforcement .... lbs.	1,450	1,100	1,100	75.8	75.8
Wooden fence .... lin. ft.	14,300	12,634	12,634	88.3	88 3
Maintaining highway traffic .... lump sum	1	100%	100%	100	100
Coffer-dams, pumping, bailing and draining, lump sum	1	100%	100%	100	100
Raising bridge superstructures .... No.	7	7	7	100	100

Engineer's estimate, $73,000. Contractor's price, $73,353.50.
Percentage of work done during year, 80.
Percentage of work done to date, 85.

Repairs to Dike and Highway south of Fulton.

M. D. Ewell, Assistant Engineer, in charge of contract. Joseph H. Conners, Fulton, N. Y., contractor.

For the repairs to the dike south of the city of Fulton, and the raised highway, which is a continuation thereof. This contract covers the same location as was formerly included in contract No. 78 and the adjacent highway, and consists of repairs to that work. These repairs were made necessary by damages due to the extreme high water, which was caused by the temporary shortening of the spillway of the upper dam, when the Taintor gates were installed. The waves, because of the wind blowing almost continuously during the high-water period, had a reach of about a mile, damaging the stone protection and partially washing out the raised highway not protected by stone work.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Embankment....................cu. yds.	3,700	2,571	2,571	69.5	69.5
Rebuilding wash wall..............cu. yds.	880	973	973	110	110
Gravel filling....................cu. yds.	200	0	0	0	0
Lining..........................cu. yds.	362	317	317	87.5	87.5
Riprap..........................cu. yds.	1,380	1,010	1,010	73	73
Stone paving.....................sq. yds.	268	144	144	54	54
Repairing fence...................lin. ft.	700	200	200	28.6	28.6

Engineer's estimate, $10,012. Contractor's price, $10,995.
Percentage of work done during year, 74.5.
Percentage of work done to date, 74.5.

OSWEGO CANAL, RESIDENCY NO. 2.

Resident Engineer James Burden reports:

Contract No. 35.

George H. Haley, Assistant Engineer, in charge.

This contract is for improving the Oswego canal between a point 0.56 of a mile above Utica street bridge and the harbor line north of Bridge street in Oswego, including the construction of locks Nos. 7 and 8, of 14.5 and 11.1 feet lift, respectively, and other incidental work. Length of contract, 0.85 mile.

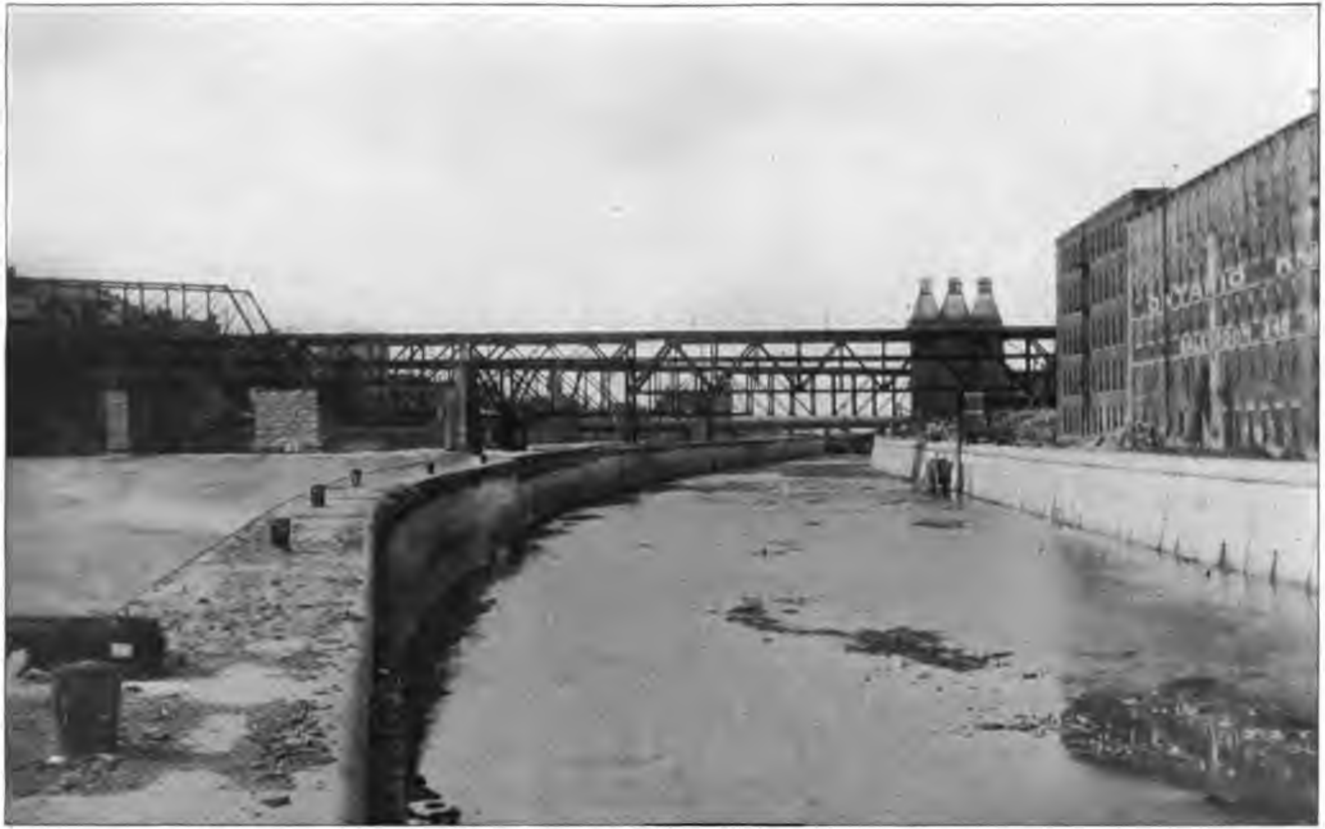
The contract was awarded to the Gilmour-Horton-Allen Company, September 16, 1907. The contract price as modified by alterations Nos. 1, 2, 3, 4, 5, 7, 8, 9, 10 and 11 is $723,632.14.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by Canal Board June 11, 1908, changes lock-gates, gate recesses, etc., to conform to new standards.

Alteration No. 2, approved by Canal Board April 14, 1909, changes location of lock No. 7; retains portion of tow-path; changes details of lock construction; omits moving weigh-lock building to decrease expense.

Alteration No. 3, approved by Canal Board October 22, 1909, enlarges bulkhead at upper end of hydraulic canal to provide greater power development.



BARGE CANAL, CONTRACT NO. 35.
View of completed prism at Oswego, looking north from lock No. 7.

Alteration No. 4, approved by Canal Board February 23, 1910, provides spoil back of east wall of lock No. 8 for docking, etc.; provides conduit back of east wall of lock No. 8 to drain operating syphon.

Alteration No. 5, approved by Canal Board March 23, 1910, provides for reconstruction of old wall on east side between locks Nos. 7 and 8 to provide better construction.

Alteration No. 7, approved by Canal Board July 19, 1911, provides for backing old wall between curved dam and guard-lock, with concrete to place in proper condition.

Alteration No. 8, approved by Canal Board October 11, 1911, provides for replacing old wall for support of roadway west of lock No. 7, due to poor condition of old wall; and same for wall adjacent to Francis Perrot malt house; substitutes spoil for embankment back of retaining wall, Sta. 1187 to Sta. 1198 (embankment not necessary).

Alteration No. 9, approved by Canal Board May 22, 1912, provides new bridge over hydraulic canal at lock No. 7 on account of poor condition of existing structure.

Alteration No. 10, approved by Canal Board June 11, 1912, increases height of spoil bank adjacent to lock No. 7 to facilitate work; provides concrete wall back of lock No. 7 to replace old wall (in poor condition); eliminates embankment, Sta. 1198 to Sta. 1203, and substitutes spoil (embankment unnecessary); provides guide piers above lock No. 7 to safeguard traffic.

Alteration No. 11, approved by Canal Board November 12, 1912, eliminates work, Sta. 1164 to Sta. 1172, and transfers same to contract No. 37 at no increased cost.

Work on this contract was nearly completed during the year.

The following table shows the percentage of work done during the year, as well as the percentage of work done to date:

ITEMS OF WORK.		Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation	cu. yds.	172,447	3,939	154,357	2.3	89.3
Sheeting and bracing	ft. B. M.	58,000	0	310	0	0.6
Embankment	cu. yds.	5,345	196	4.268	3.7	80
Lining	cu. yds.	293	198	198	67.6	67.6

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Puddle....cu. yds.	490	0	390	0	79.7
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	40,970	10,487	25,566	25.3	62.4
Sawed lumber, spruce....ft. B. M.	1,500	0	1,300	0	86.6
Sawed lumber, white oak in miter-sills and gates....ft. B. M.	12,900	5,826	12,266	45.2	95
Sawed lumber, white oak....ft. B. M.	44,600	18,467	40,485	41.4	90.7
Sawed lumber, creosoted yellow pine or Douglas fir....ft. B. M.	13,000	14,478	14,478	111.4	111.4
Second-class concrete....cu. yds.	55,800	528	52,654	0.9	94.4
Reinforced concrete....cu. yds.	1,661	149	1,647	9.9	99.1
First-class masonry bridge coping....cu. yds.	4	2	2	50	50
Pointing old masonry....lin. ft.	3,400	0	2,221	0	65
Fourth-class riprap....cu. yds.	95	0	5	0	5.1
4-inch wrought iron pipe and specials....lbs.	6,960	0	5,936	0	85.3
5-inch wrought iron pipe and specials....lbs.	880	0	736	0	83.7
2-inch pipe valves....No.	2	0	2	0	100
4-inch pipe valves....No.	8	0	8	0	100
12-inch pipe valves....No.	2	0	2	0	100
20-inch pipe valves....No.	2	0	2	0	100
7-inch vacuum gages....No.	4	0	4	0	100
Structural steel....lbs.	475,480	112,785	434,252	23.8	91.3
Metal in lock-gates....lbs.	406,000	22,411	385,077	55.4	94.8
Metal in needle-dams....lbs.	85,000	3,150	79,077	3.7	93.2
Metal in lock-valves....lbs.	33,000	0	31,125	0	94.3
Metal reinforcement....lbs.	230,240	15,220	193,664	66.2	84
Iron castings, plain....lbs.	52,950	4,001	41,167	7.7	78.3
Iron castings, machined....lbs.	17,300	0	16,141	0	93.2
Wood block pavement....sq. yds.	500	0	439	0	87.8
Fender fastenings....No.	1,060	0	984	0	92.8
Expansion bolts in place....No.	115	0	55	0	47.8
Wrought iron pipe railing....lin. ft.	1,420	1,247	1,247	87.7	87.7
Scroll railing....lin. ft.	440	0	396	0	90
Gate hoists, class " A "....No.	2	2	2	100	100
Gate hoists, class " B "....No.	12	2	11.5	16.7	95.8
Gate hoists, class " E "....No.	5	0.45	5	9	100
Removing old bridge superstructures,, lump sum	$100	0	$75	0	75
Raising buildings....lump sum	$900	0	$900	0	100
Maintaining highway traffic....lump sum	$500	0	$375	0	75
Conduit, east of lock No. 8....lump sum	$500	0	$400	0	80
Removing concrete in bridge abutments lump sum	$73.85	0	$73.85	0	100
Removing hydraulic canal bridge and bulkhead gates....lump sum	$850	$510	$510	60	60

Total of all work done during year = 3.7 per cent of estimated cost.
Total of all work done to date = 92.3 per cent of estimated cost.
Not included in the above is extra and unspecified work order, dated August 4, 1913, amounting to $2,463.36, which was completed during the year.

Contract No. 90.

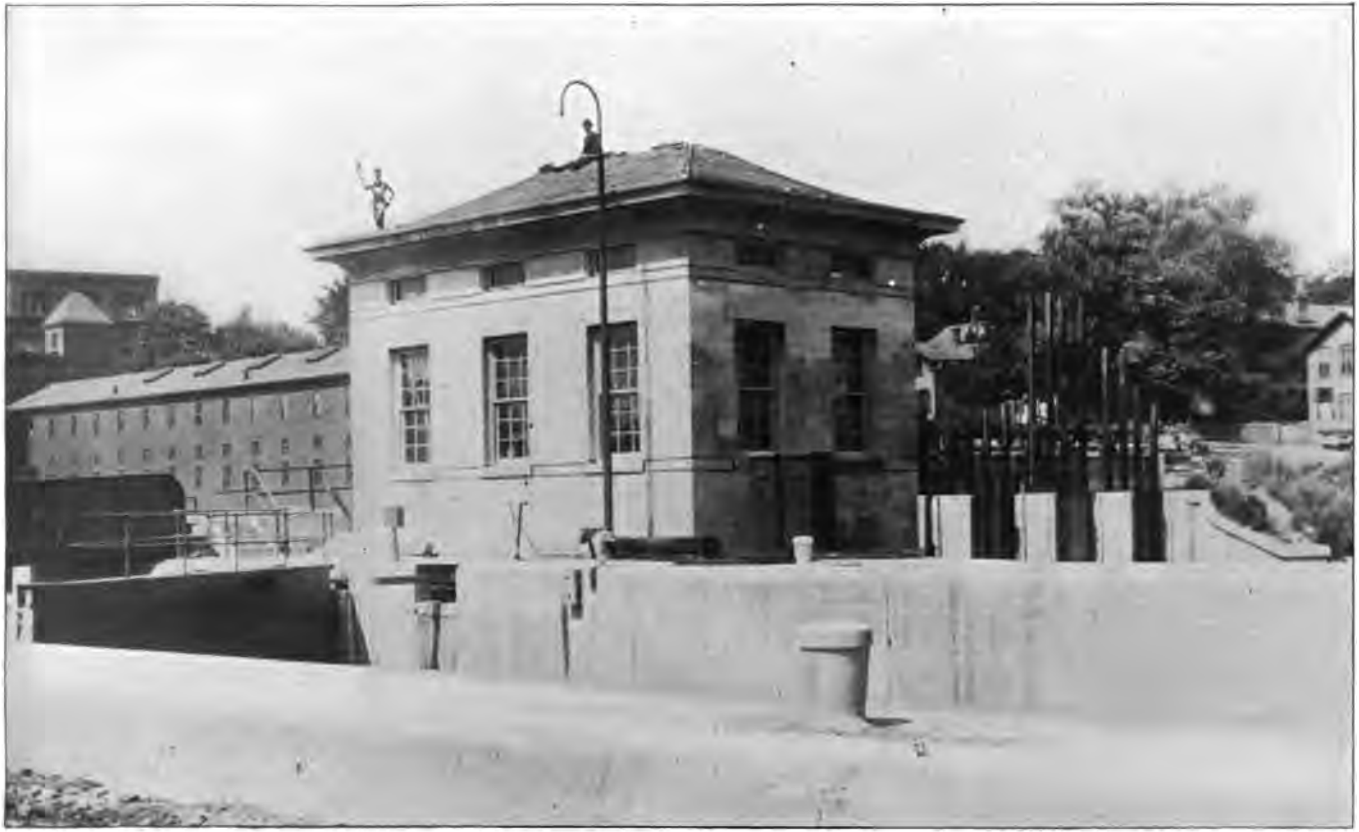
George H. Haley, Assistant Engineer, in charge.

This contract is for furnishing and installing equipment for operating and lighting locks Nos. 7 and 8 on the Oswego canal and similar work on other residencies.

The contract was awarded to D'Olier Engineering Co., April 12, 1910.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by Canal Board August 9, 1910, improves design of connection between turbines and governors.



Barge Canal, Contract No. 90.
Power-house at lock No. 7, Oswego.

Alteration No. 2, approved by Canal Board December 29, 1910, makes changes in ducts, conduits, machinery recesses, pull boxes, junction boxes, etc., to procure better construction and fit field conditions.

Alteration No. 3, approved by Canal Board June 28, 1911, changes type of conduit crossings for lock and location of controllers, lamp poles and conduits, to secure better construction and expedite work.

Alteration No. 4, approved by Canal Board October 22, 1912, eliminates unfinished work at locks Nos. 2, 7 and 8, Oswego canal (concrete work not completed); makes changes in conduit construction at lock No. 8, Oswego canal, and lock No. 12, Champlain canal, to facilitate construction and suit field conditions.

The contract was completed in December, 1912.

The following table gives the summary of work done on this residency:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Chipping concrete....................cu. ft.	....	7.2	8	....	....
Second-class concrete................cu. yds.	....	0.3	0.3	....	....
Structural steel.........................lbs.	....	1,136	38,533	....	....
Iron castings, plain.....................lbs.	....	2,656	22,780	....	....
Metal ducts..............................lbs.	....	1,607	15,878	....	....
Reinforced concrete conduit, double duct, lin ft.	....	5	523	....	....
Drilling 1½-inch holes for ducts.........lin. ft.	....	19	70	....	....
Drilling 3-inch holes for ducts..........lin. ft.	....	11	167	....	....
Lead-covered, rubber-insulated conductors, lbs.	....	-106	10,430	....	....
Miscellaneous electrical equipment, lock No. 8, lump sum	$1,932	$100.46	$1,932	....	100
Miscellaneous electrical equipment, lock No. 7, lump sum	$3,435	$202.67	$3,435	....	100
Maintenance accessories, lock No. 7. lump sum	$30	0	$30	0	100
Maintenance accessories, lock No. 8 lump sum	$30	0	$30	0	100
Coffer-dams, pumping and bailing...lump sum	$50	$50	$50	100	100
Valve-operating machinery..............lbs.	....	1,459	16,834	....	....
Gate-operating machinery...............lbs.	....	326	41,461	....	....
Lamp poles.............................No.	15	3	15	20	100
3-hp. motors...........................No.	4	0	4	0	100
7½-hp. motors..........................No.	8	0	8	0	100
Metal ducts, delivered.................lbs.	....	186	186	....	....
Lead-covered rubber-insulated conductors, delivered...........................lbs.	....	771	771	....	....
Lamp poles, delivered..................No.	3	3	3	100	100

Not included in the above are extra and unspecified work orders of July 25, September 12 and December 19, 1912, amounting to $381.31.

Contract No. 37.

Edward M. Ellis, Assistant Engineer, in charge.

This contract is for improving the Oswego canal between Fulton and Oswego, including the construction of locks Nos. 5 and

6, of 20 and 18 foot lift, respectively, with adjoining dams and other incidental work. Length of contract, 9.73 miles.

The contract was awarded on December 9, 1910, and transferred on April 19, 1911, to Henry P. Burgard. The contract price, including alterations Nos. 1, 2, 3, 4, 5, 6, 7 and 8, is $2,500,118.76.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by Canal Board September 27, 1911, flattens side slopes, Sta. 660 to Sta. 680 and eliminates wash wall on account of soft material.

Alteration No. 2, approved by Canal Board January 11, 1912, strengthens gate hoist, class "A," for more rapid operation; extends dike west of lock No. 5 to provide highway.

Alteration No. 3, approved by Canal Board March 11, 1912, provides guide cribs at upper end of lock No. 5 to safeguard traffic.

Alteration No. 4, approved by Canal Board June 11, 1912, increases sections of dams Nos. 5 and 6 to insure stability; provides for excavating dike below lock No. 6 to prevent same being carried away and deposited in channel, and for excavation of rock at approach to bulkhead No. 6 to improve hydraulic conditions.

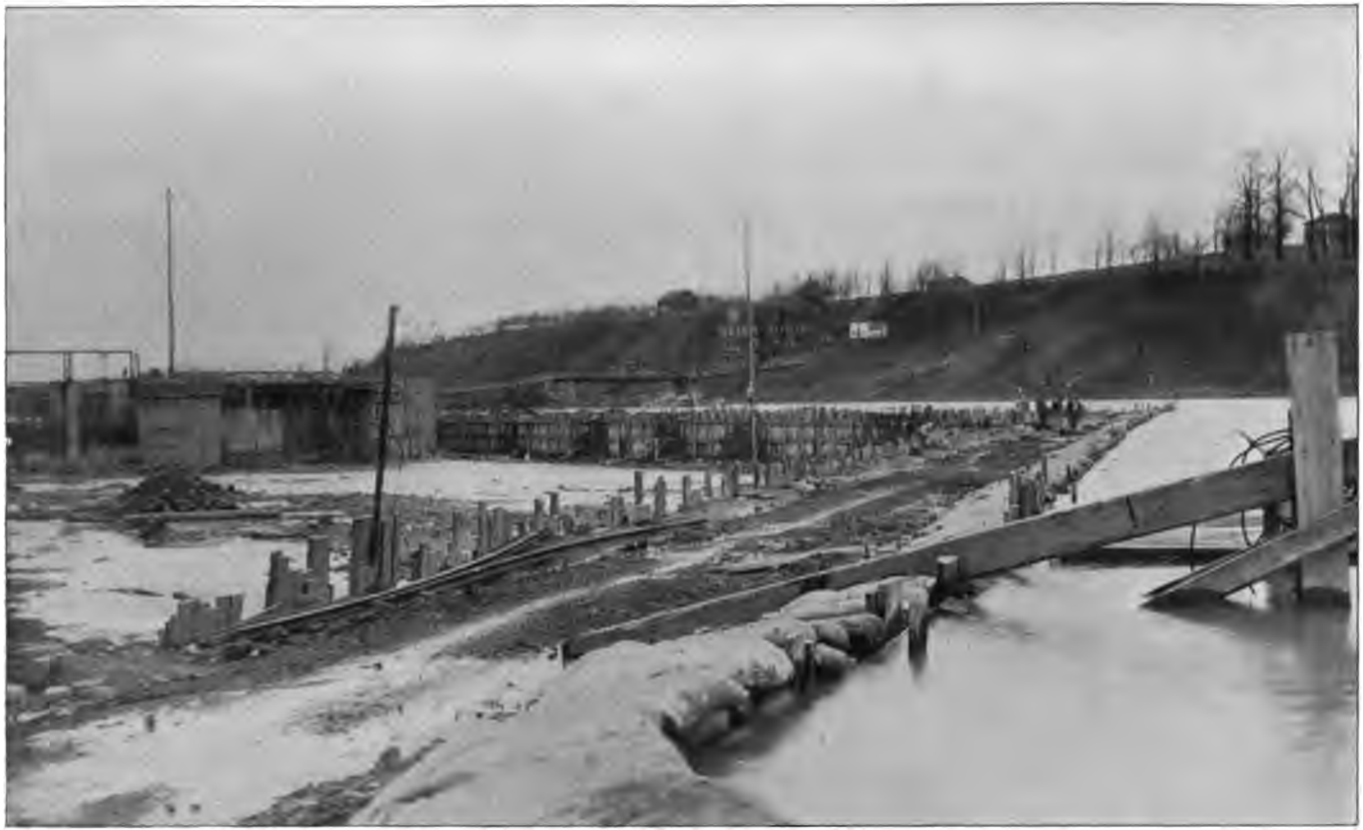
Alteration No. 5, approved by Canal Board June 11, 1912, changes plans for operating platforms of bulkheads Nos. 5 and 6 to secure greater strength.

Alteration No. 6, approved by Canal Board July 23, 1912, provides additional coffer-dams, etc., made necessary by alteration No. 4.

Alteration No. 7, approved by Canal Board November 12, 1912, adds to contract a portion of contract No. 35, Sta. 1164 to Sta. 1172.

Alteration No. 8, approved by Canal Board April 22, 1913, increases size of field office to provide adequate accommodations for engineering force.

The placing of concrete at both locks Nos. 5 and 6 is nearing completion and work is progressing on the coffer-dams for both dams.



BARGE CANAL, CONTRACT NO. 37.

View of the coffer-dam at Minetto lock, showing method employed to prevent overflow during the high flood of March, 1913.

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The following table gives a summary of work done during the year and the total work done to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing........................lump sum	$1,000	$75	$255	7.5	25.5
Excavation........................cu. yds.	1,001,210	193,710	835,193	19.3	83.6
Sheeting and bracing...............ft. B. M.	325,000	0	18,900	0	5.8
Sheeting and bracing (reused).......ft. B. M.	....	0	42,500	0	....
Embankment.......................cu. yds.	16,600	1,021	12,423	6.2	74.8
Sawed lumber.....................ft. B. M.	75,283	6,200	6,200	8.2	8.2
White oak lumber in lock-gates......ft. B. M.	17,000	7,800	7,800	45.9	45.9
Second-class concrete...............cu. yds.	88,297	47,036	49,054	53.3	55.6
Structural steel.........................lbs.	448,190	162,758	163,879	36.3	36.6
Metal reinforcement....................lbs.	113,480	83,816	93,521	73.9	82.4
Iron castings, plain....................lbs.	25,920	19,527	20,335	75.3	78.5
Iron castings, machined................lbs.	51,900	31,870	32,336	61.4	62.3
Metal in lock-gates....................lbs.	533,000	244,633	244,633	45.9	45.9
Metal in buffer-beams..................lbs.	167,500	71,234	71,234	42.5	42.5
Metal in lock-valves...................lbs.	67,500	26,844	26,844	39.8	39.8
Drilling bolt holes in rock............lin. ft.	4,070	2,146	2,734	52.7	67.2
Coffer-dams, pumping, bailing and draining, lump sum	$43,510	$20,945.60	$22,040	48.1	50.6
Maintaining navigation............lump sum	$500	0	$125	0	25
Removing buildings.....................No.	20	0	1.5	0	7.5
Removal of bridge superstructure...lump sum	$300	0	$300	0	100
6-in. vitrified pipe and specials.........lin. ft.	200	108	208	53	104
18-in. vitrified pipe and specials.......lin. ft.	2,200	0	2,012	0	91.5
Gate hoists, class " A," revised..........No.	18	17	17	94.4	94.4
Wrought iron pipe railing............lin. ft.	377	182	182	48.3	48.3
Field office, alteration No. 8........lump sum	$725	$725	$725	100	100

Total of all work done during year = 30.2 per cent of estimated cost.
Total of all work done to date = 73.5 per cent of estimated cost.

Road " A," adjacent to Contract No. 37.

Edward M. Ellis, Assistant Engineer, in charge.

This contract is for constructing a highway at the west end of dam No. 6, made necessary by the canal improvement. Length, about 1,400 feet.

The contract was awarded to H. P. Burgard, January 3, 1912. The contract price is $4,629.

The following table gives a summary of the work done during the year and the total work done to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.........................cu. yds.	400	156	175	39	43.8
Forming embankment................cu. yds.	6,900	4,099	5,748	59.4	83.3
Lining.............................cu. yds.	800	52	52	6.5	6.5
Second-class concrete................cu. yds.	35	0	17	0	48.5
Metal reinforcement.......... ....lbs.	300	0	143	0	47.7
15-in. vitrified pipe and specials........lin. ft.	360	56	375	15.6	104.2

Total of all work done during year = 24.4 per cent of estimated cost.
Total of all work done to date = 39.2 per cent of estimated cost.

Road "B," adjacent to Contract No. 37.

Edward M. Ellis, Assistant Engineer, in charge.

This contract is for constructing a highway through the southern end of and to the south of Minetto, made necessary by the construction of the canal improvement. Length, 5,960 feet, approximately.

The contract was awarded to H. P. Burgard, January 3, 1912. The contract price, including alteration of November 30, 1912, is $91,531.

The contract has been completed. The following table gives a summary of the work done during the year and the total work done to date, subject to slight modification in the final estimate:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... lump sum	$100	$5	$100	5	100
Excavation .... cu. yds.	40,125	1,552	37,128	3.9	92.5
Forming embankment .... cu. yds.	31,750	246	29,246	0.8	92.1
Lining .... cu. yds.	1,610	188	1,823	11.7	113.2
Second-class concrete .... cu. yds.	130	15	117	11.5	90
Third-class riprap .... cu. yds.	450	117	117	26	26
Fourth-class riprap .... cu. yds.	290	175	175	60.3	60.3
Broken stone macadam in bottom course, cu. yds.	300	245	245	81.7	81.7
Broken stone macadam in top course .. cu. yds.	150	134	134	89.3	89.3
Macadam stone, Nos. 2 and 3 mixed, in place, cu. yds.	12	9	9	75	75
Bituminous material "A" .... gals.	4,100	3,851	3,851	93.9	93.9
Metal reinforcement .... lbs.	1,560	156	1,193	10	76.5
Cobble paving .... sq. yds.	320	189	189	59.1	59.1
Guard railing .... lin. ft.	6,400	3,991	3,991	62.3	62.3
Rock spoil .... cu. yds.	13,625	9,100	9,100	66.8	66.8

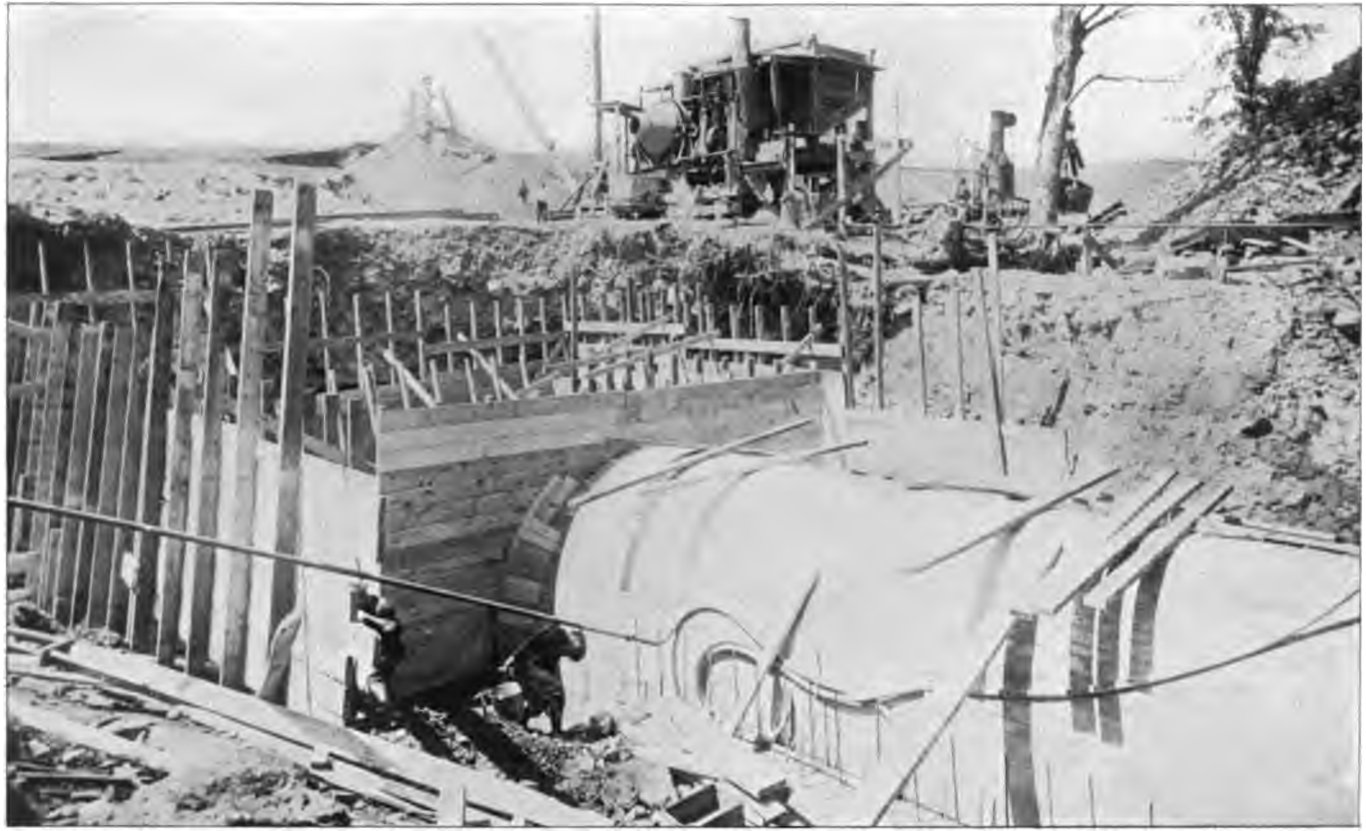
Total of all work done during year = 12.6 per cent of estimated cost.
Total of all work done to date = 89.4 per cent of estimated coast.

Contract No. 90-A.

George H. Haley, Assistant Engineer, in charge.

This contract is for the furnishing and equipment of a hydroelectric power plant at lock No. 7, electric capstans at locks Nos. 7 and 8 and transmission lines, arc light poles and arc lights between lock No. 8 and the power plant at lock No. 7 and similar work on Residency No. 1, Oswego canal.

The contract was awarded to Lupfer & Remick, August 8, 1912. The contract price for the portion of the work on this residency is $12,714.96.



BARGE CANAL, CONTRACT NO. 51.
Building barrel and outlet chamber of dive culvert, where canal feeder crosses Cincinnatus creek.

The following table gives the summary of work done on this residency:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation .... cu. yds.	50	10	10	20	20
Chipping concrete .... cu. ft.	32	27	27	84.4	84.4
Chipping edges of machinery recess ..... lin. ft.	34.6	34	34	98.3	98.3
Second-class concrete .... cu. yds.	27.4	22	22	80.3	80.3
First-class reinforced concrete .... cu. yds.	158.8	151	151	95.1	95.1
Structural steel .... lbs.	6,473	6,293	6,293	97.2	97.2
Metal reinforcement .... lbs.	11,137	10,598	10,598	95.2	95.2
Iron castings, machined .... lbs.	2,550	2,550	2,550	100	100
Drilling 1½-in. holes .... lin. ft.	14	6	6	42.9	42.9
Drilling 3-in. holes .... lin. ft.	6	4	4	66.7	66.7
Squares, roofing .... squares	11.15	11	11	98.7	98.7
Painting concrete .... sq. yds	290	280	280	96.6	96.6
Electrical equipment .... lump sum	$5,500	$55	$55	1	1
Traveling crane .... lump sum	$480	$480	$480	100	100
Doors, windows and woodwork ..... lump sum	$480	$480	$480	100	100
Coffer-dams, pumping, bailing and draining, lump sum	$240	$21.60	$21.60	9	9

Total of all work done during year = 52.7 per cent of estimated cost.
Total of all work done to date = 52.7 per cent of estimated cost.

Contract No. 37-R.

Edward M. Ellis, Assistant Engineer, in charge.

This contract is for the removal of bodies from the Minetto cemetery, located within the limits of contract No. 37, to a new cemetery located outside the flow line.

The contract was awarded to Salladin & Henrick, November 29, 1912, for $4,890.80.

The contract has been completed. The following table gives a summary of the work done during the year and the total work done to date:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Large boxes .... No.	150	20	20	13.3	13.3
Small boxes .... No.	275	242	242	88	88
Bodies in large boxes, for exhuming, transporting and reinterring in new cemetery No.	135	20	20	14.7	14.7
Bodies in small boxes, for exhuming, transporting and reinterring in new cemetery ..... No.	265	252	252	95.1	95.1
Bodies, for exhuming, transporting and reinterring in other cemeteries .... No.	25	23	23	92	92
For taking up, transporting and resetting monuments in new cemetery .... No.	80	72	72	90	90

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
For taking up, transporting and resetting monuments in other cemeteries.........No.	12	10	10	83.3	83.3
For taking up, transporting and resetting tablets or markers in new cemetery.....No.	190	185	185	97.4	97.4
For taking up, transporting and resetting tablets or markers in other cemeteries...No.	25	28	28	112	112
For furnishing, painting, numbering and setting new markers.....................No.	200	140	140	70	70
Concrete foundation..................cu. ft.	1,000	1,036.5	1,036.5	103.6	103.6
Fence, including gates, posts, etc.......lin. ft.	900	872	872	96.8	96.8

Total of all work done during year = 74.6 per cent of estimated cost.
Total of all work done to date = 74.6 per cent of estimated cost.
Not included in the above is an extra and unspecified work order, dated May 23, 1913, amounting to $23, which was completed during the year.

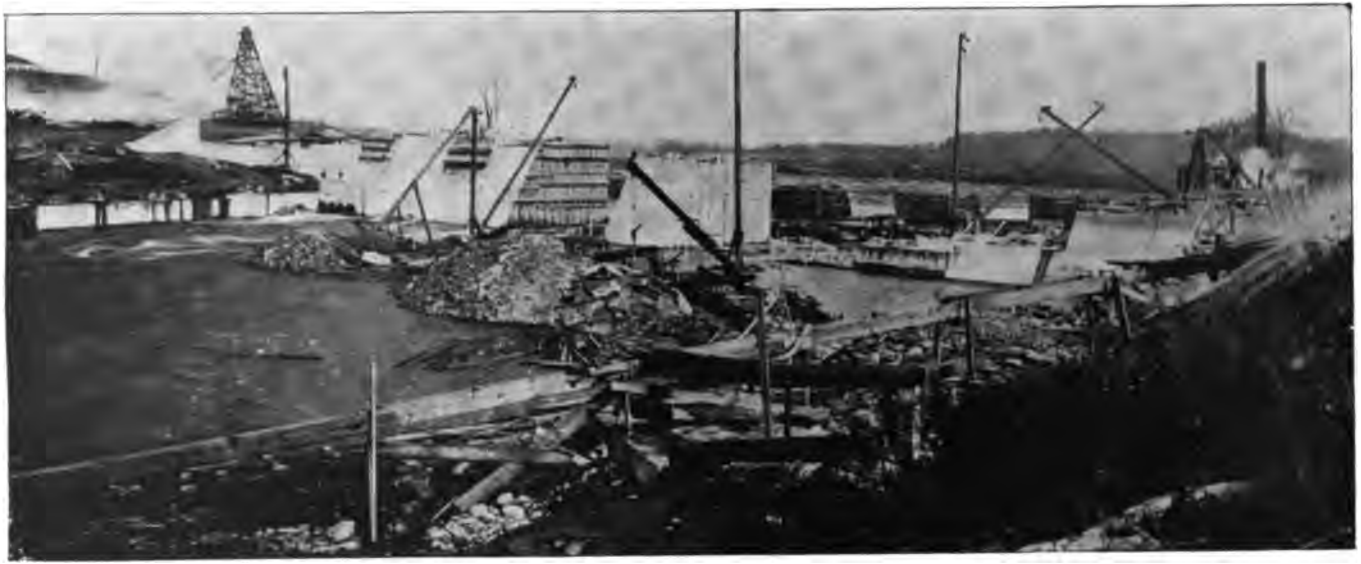
WATER-SUPPLY RESIDENCY.

Resident Engineer L. C. Hulburd reports:

The Water-Supply Residency comprises the work of providing the additional water-supply required by the Barge canal for the "Rome summit level." Present developments consist of the Mohawk river, West Canada creek and Nine-Mile creek, the latter stream being used, in addition to supplying the drainage from its own watershed, as a channel through which flood waters, impounded by a reservoir on the West Canada creek, are to be diverted into the summit level. The residency is divided into two parts, with headquarters at Rome and Hinckley. The portion under the Rome division, to which the following report applies, includes the Mohawk river developments and the feeder which will divert water from West Canada creek to Nine-Mile creek. The construction required for these projects is being done under two principal contracts, Nos. 51 and 55.

Contract No. 51.

Contract No. 51 is for constructing a canal feeder between Trenton Falls and Nine-Mile creek, together with a gate house, culverts and all other work appertaining to the contract. H. A. Gehring and Walter F. Shaw, Assistant Engineers, have had charge of the engineering corps assigned to this contract.



Barge Canal, Contract No. 50.
General view of the masonry portion of the dam at Hinckley reservoir.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by Canal Board March 11, 1912, changes alignment of feeder, Sta. 75 to Sta. 133, to reduce curvature; provides concrete lining in channel, Sta. 130 to Sta. 134, on account of porous material, and riprap on bank along Cincinnatus creek, Sta. 130 to Sta. 135, to prevent erosion.

Alteration No. 2, approved by Canal Board May 22, 1912, eliminates dive culvert and incidental work at Sta. 26 as unnecessary.

Alteration No. 3, approved by Canal Board August 27, 1912, provides diversion of Cincinnatus creek to avoid damage to prism, etc.

Alteration No. 4, approved by Canal Board October 22, 1912, provides sluice-gate for drainage of prism at Sta. 26; modifies section of channel, Sta. – 2 + 77 to Sta. 0, on account of location of rock; shifts location of creek slightly, Sta. 129 to Sta. 137 to avoid destroying growth of willows; widens embankment, Sta. 75 to Sta. 127, to insure greater stability.

The principal part of this contract is the excavation of feeder prism, the cuts for which reach a maximum depth of forty feet. In addition to the construction of prism section there are eight highway crossings, a concrete dive culvert for carrying the flow under Cincinnatus creek, a gate house with controlling works and a flume for passing the water down the steep bank into Nine-Mile creek.

The contract was awarded to Geo. T. Cunningham on December 23, 1910, and was later assigned to the Alto Construction Company. Construction work was commenced in February, 1911, and continued to date, excepting four months' suspension during the winter of 1912–13. The rough excavation of the feeder prism has been made for 80 per cent of the total length and some 47 per cent of the cut taken out through the remaining portion. In addition to the prism excavation and the embankment, which has been formed during the past year, one highway crossing has been completed and the concrete portion of the dive culvert under Cincinnatus creek finished.

The following table, including alterations and increases, as authorized by the Canal Board, shows the progress of construction to date:

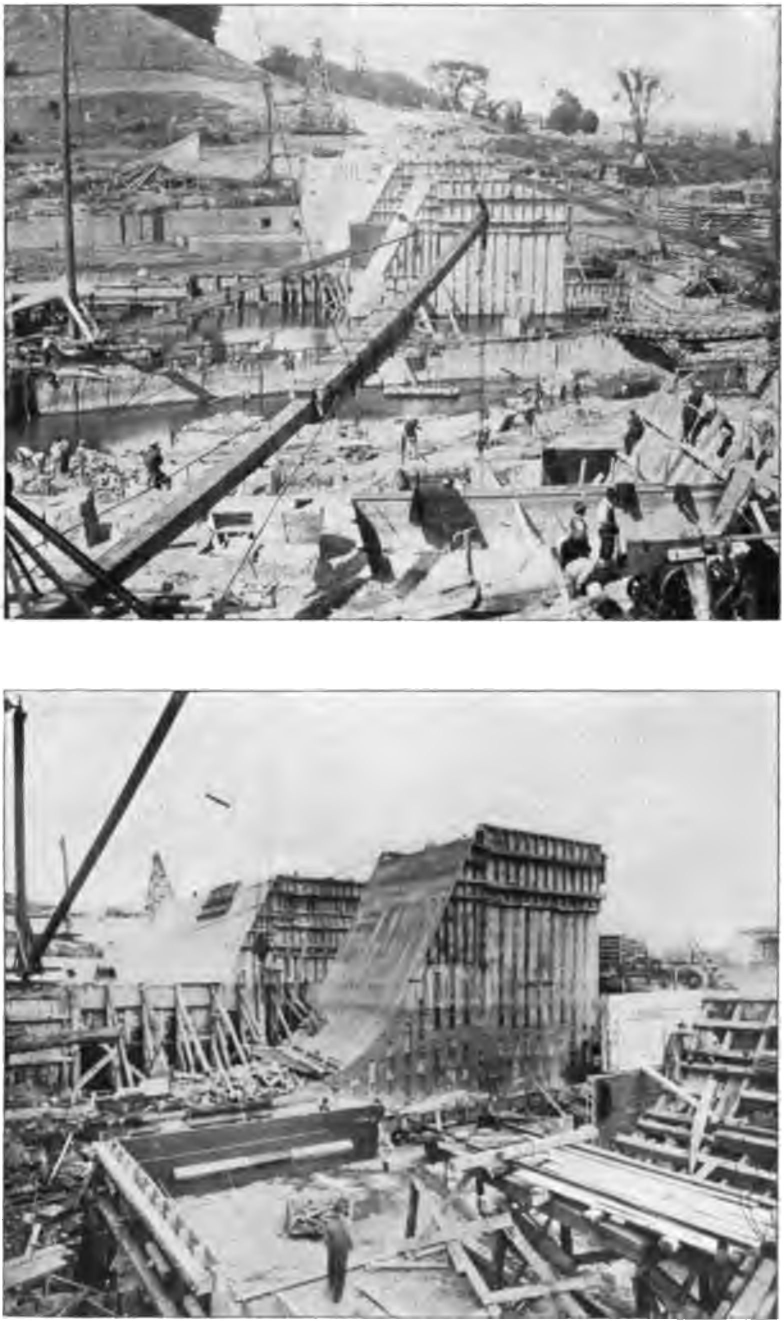
ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... lump sum	1	0	86%	0	86
Excavation .... cu. yds.	539,610	122,168	403,646	22.6	74.8
Sheeting and bracing .... ft. B. M.	112,000	6,854	14,621	6.1	13
Forming embankment .... cu. yds.	105,415	57,892	65,558	54.9	62.2
Lining .... cu. yds.	800	0	239	0	29.9
Foundation piles .... lin. ft.	6,740	0	340	0	5
Wooden sheet-piling .... ft. B. M.	22,000	0	3,665	0	16.7
Second-class concrete .... cu. yds.	3,606	1,205	2,167	33.4	60.1
Second-class reinforced concrete .... cu. yds.	960	212	699	22.1	72.8
Cobblestone paving .... sq. yds.	1,970	106	106	5.4	5.4
Second-class riprap .... cu. yds.	1,140	0	148	0	13
Third-class riprap .... cu. yds.	2,105	3	3	0.1	0.1
Cast iron pipe .... lbs.	56,510	46,823	57,061	82.9	101
12-in vitrified pipe .... lin. ft.	40	37	37	92.5	92.5
Metal reinforcement .... lbs.	36,450	8,618	18,632	23.6	51.1
Wooden fence .... lin. ft.	10,000	666	666	66.6	66.6
Wrought iron pipe railing .... lin. ft.	330	114	280	34.5	84.8
Drilling bolt holes in rock .... lin. ft.	280	122	122	43.6	43.6
Coffer-dam, pumping, bailing, etc ... lump sum	1	38%	54%	38	54
Maintaining highway traffic .... lump sum	1	43%	59%	43	59
Removing buildings .... No.	6	0	1	0	16.7
Office building .... No.	1	0	1	0	100
Gross estimate	$400,227.33	$82,060.00	$231,690.00	20.5	57.9
Extra or unspecified work orders:					
Dated August 9, 1912	$816	0	$816	0	100
Dated November 12, 1912	$180	$126	$126	70	70
Dated September 11, 1913	$10,125.60	0	0	0	0

Contract No. 55.

Contract No. 55, providing for constructing of a reservoir dam on the Mohawk river, for relocating a portion of the Black River canal, for building four locks and performing all other work appertaining to the contract, was completed during the fiscal year ended September 30, 1912. During the early part of this year final estimates were completed. Other contracts in connection with the Delta reservoir have been completed. These are No. 55-R, for removal and reinterment of bodies which had been buried on the reservoir site, a contract for the construction of highways about the reservoir and a contract for the erection of a dwelling for the gate tender. This latter contract, which was awarded to Lawrence Carey of Rome on December 19, 1912, was completed at a cost of $2,234.45.

Final payments for contracts in connection with the construction of the Delta reservoir have been as follows:

Contract No. 55	$884,810 39
Contract No. 55-R	7,627 53



BARGE CANAL, CONTRACT NO. 50.
Views of the gate chamber and spillway sections of the dam at Hinckley reservoir.

Construction of highways adjacent to reservoir....	$45,314 70
Construction of gate tender's dwelling..........	2,234 45
Total..................................	$939,987 07

WATER-SUPPLY RESIDENCY.

Resident Engineer Harry J. Morrison reports:

Contract No. 50.

This contract provides for the construction of the Hinckley dam and reservoir on West Canada creek.

Geo. H. Briggs, Assistant Engineer, has had charge of the engineering corps assigned to this contract. The contract was awarded to the Buffalo Dredging Co. on September 23, 1910, and construction begun the following November.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by Canal Board November 1, 1911, changes gate operating stands, etc., and steel work for gate chambers to secure more efficient operation and better construction.

Alteration No. 2, approved by Canal Board May 22, 1912, changes foundations, etc., of dam to insure stability against unusual floods.

Alteration No. 3, approved by Canal Board June 11, 1912, substitutes line drilling for channeling to expedite work and decrease cost.

During the past year construction work was suspended in December and resumed in April.

The embankment portion of the dam is divided into a north and south portion by a masonry section about 500 feet long, comprising a spillway 400 feet long with an abutment and gate house at each end. The crest of the spillway, when completed, will be at elevation 1225, the embankment portion at elevation 1242 and the gate-house section at elevation 1240. The total length of the dam is approximately 3,600 feet.

The excavation for the north abutment is computed and a portion of the masonry commenced. The masonry in the south abutment is at an average elevation of 1192.

At the north gate house the masonry has been laid to elevation 1197 and the four 60-inch discharge pipes, the 5′ x 5′ sluice gates and the 48-inch and 30-inch valves have been placed. At the south gate house the inlet chamber has been excavated, the 42-inch pipes, sluice gates and screens set and the masonry built to elevation 1187.

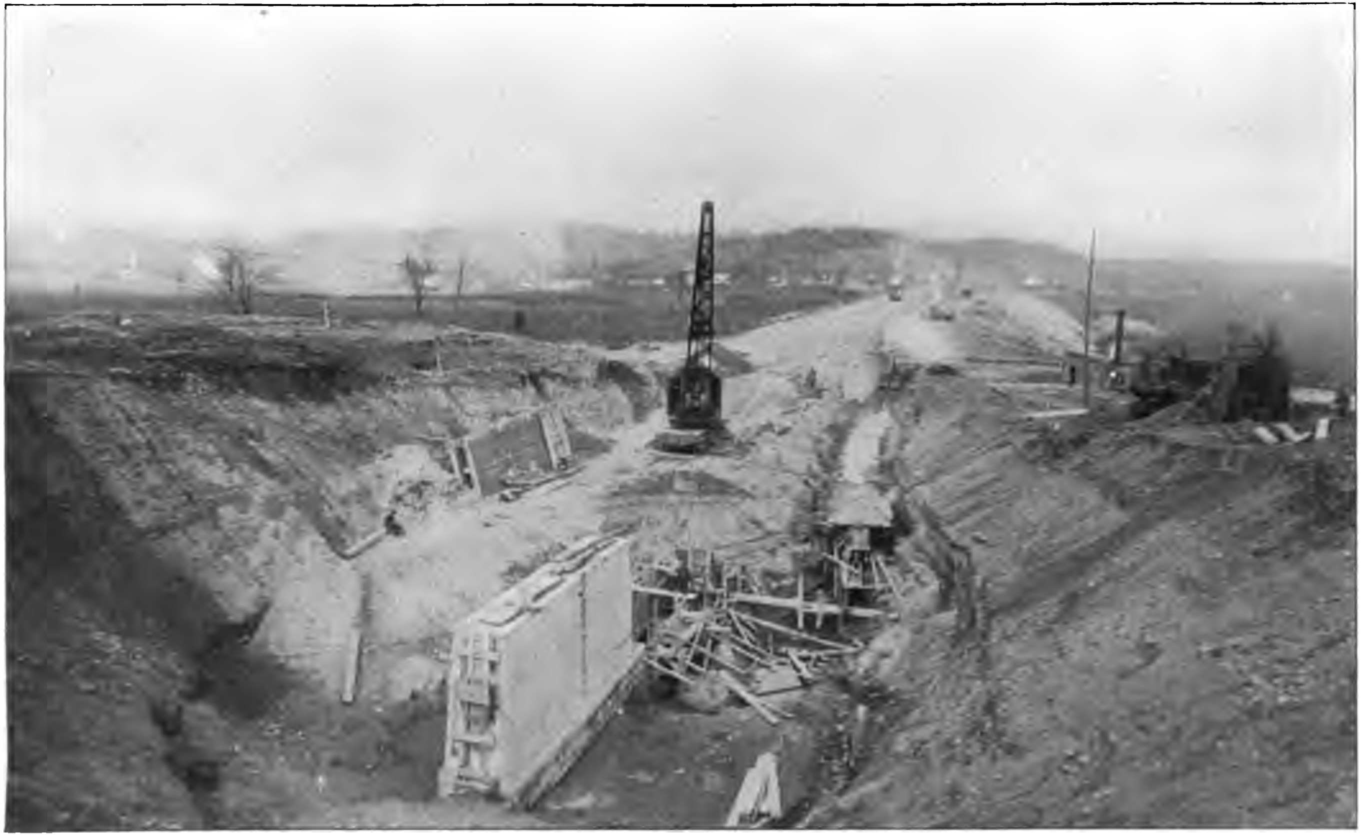
For 180 feet at the north end and for 85 feet at the south end of the spillway the foundations have been prepared and, excepting for 60 feet, which has been left at elevation 1162 to pass the flow of the creek, the masonry has been begun and is at average elevation 1192.

Practically nothing has been done on the core-wall and embankment north of the masonry section. South of the masonry section the core-wall for a length of 2,330 feet of a probable total length of 2,600 feet is at an average elevation of 1,223 with a few sections carried up to full height.

The embankment of the southerly portion is at an average elevation of 1215. The riprap on the upstream face is finished to an average elevation of 1210. About 1,100 linear feet of drainage ditch at the toe of the embankment has been completed.

The following summary shows the amount of work put under contract and the amount done to September 30, 1913, including alterations in force:

ITEMS OF WORK.	Preliminary estimate, as affected by all alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... lump sum	$20,500	18%	25.6%	18	25.6
Excavation .... cu. yds.	137,700	41,420	120,122	30.1	87.2
Sheeting and bracing .... ft. B. M.	420,000	6,754	220,229	1.6	52.4
Embankment .... cu. yds.	611,210	197,415	313,203	32.3	51.2
Lining .... cu. yds.	7,430	1,602	2,543	21.5	34.2
Second-class concrete .... cu. yds.	8,910	6,135	7,460	68.8	83.7
Third-class concrete .... cu. yds.	37,090	5,194	25,530	14	68.8
Reinforced concrete .... cu. yds.	110	50	50	45.4	45.4
Cyclopean masonry .... cu. yds.	63,910	22,998	27,012	35.9	42.2
Cobblestone paving .... sq. yds.	4,435	1,140	1,140	25.7	25.7
Third-class riprap .... cu. yds.	20,440	2,776	5,115	13.5	25
Fourth-class riprap .... cu. yds.	2,475	350	492	14.1	19.8
Cast iron pipe and specials .... lbs.	536,000	223,656	520,370	41.7	97.1
Vitrified pipe .... lin. ft.	125	21	21	16.8	16.8
Structural steel .... lbs.	88,700	12,843	12,843	14.4	14.4
Metal reinforcement .... lbs.	34,235	14,371	19,141	41.9	55.8
Iron castings, plain .... lbs.	41,000	10,866	14,406	26.5	35.1
Iron castings, machined .... lbs.	8,650	6,888	6,888	79.6	79.6
Drilling bolt holes in rock .... lin. ft.	1,780	1,227	1,329	68.9	74.6
Sluice gates, etc., north gate chamber, lump sum	$7,100	85%	85%	85	85
Sluice gates, etc., south gate chamber, lump sum	$3,000	0	48%	0	48
Coffer-dams, pumping, bailing and draining, lump sum	$18,000	55.2%	70%	55.2	70
Maintaining highway traffic .... lump sum	$500	40%	90%	40	90
Line drilling, alteration No. 3 .... sq. ft.	46,000	19,476	44,513	42.3	96.7
Gross estimate	$971,768	$296,690	$530,580	30.5	54.6



BARGE CANAL, CONTRACT NO. 50.
Earthen portion of the dam at Hinckley reservoir. A section of core wall is seen in the foreground.

Highways Adjacent to Hinckley Reservoir.

Two sections of new highway and a section of temporary road adjacent to contract No. 50, made necessary by the building of the Hinckley reservoir, are being constructed under contract No. 50 by the Buffalo Dredging Co. under order dated June 26, 1912, as amended by order dated July 11, 1913.

Construction was commenced during the month of April, 1913.

The following summary shows the amount of work placed under contract and the amount done to September 30, 1913:

ITEMS OF WORK.	Preliminary estimate, as affected by all alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... lump sum	$320	95%	95%	95	95
Bailing and draining .... lump sum	$300	90%	90%	90	90
Excavation .... cu. yds.	38,600	32,851	32,851	85.1	85.1
Embankment .... cu. yds.	31,100	24,720	24,720	79.5	79.5
Lining .... cu. yds.	440	319	319	72.5	72.5
Second-class concrete .... cu. yds.	343	334	334	97.4	97.4
12-in. stone paving .... sq. yds.	230	196	196	85.2	85.2
Cobblestone paving .... sq. yds.	820	820	820	100	100
Cast iron pipe .... lbs.	30,100	30,100	30,100	100	100
Fourth-class riprap .... cu. yds.	760	363	363	47.8	47.8
Metal reinforcement .... lbs.	4,900	3,288	3,288	67.1	67.1
Sawed lumber .... ft. B. M.	500	500	500	100	100
Wooden fence .... lin. ft.	8,750	3,136	3,136	35.8	35.8
6-in. vitrified pipe underdrain, including excavation, lining and backfill .... lin. ft.	1,000	300	300	30	30
Building and maintaining temporary highway, lin. ft.	5,500	5,023	5,023	91.3	91.3
Gross estimate	$41,927	$34,090	$34,090	81.3	81.3

CAYUGA AND SENECA CANAL, RESIDENCY NO. 1.

Resident Engineer L. S. Hulburd reports:

Construction work now in progress is under four contracts:

Contract A. For the construction of lock No. 1 and dam No. 1 near Cayuga. Length, 0.25 mile. Contract price, $376,233.

Contract B. For excavating a channel mainly in the Seneca river from Montezuma to deep water in Cayuga lake and from Cayuga lake to Seneca Falls. The remainder of the contract, west of Waterloo, is included in the Waterloo Residency. Contract price of eastern portion, $1,166,167.17.

Contract C. For constructing locks, dam, etc., at Seneca Falls. Contract price, $1,189,246.50.

Contract H. For excavating a channel in Cayuga lake inlet from a point about 300 feet north of Cascadilla street to deep water in Cayuga lake. Length, 1.75 miles. Contract price, $216,510.

Miscellaneous work. Property monuments and center line monuments have been placed along the eastern portion of contract B. Property surveys were made for the land and buildings to be appropriated under contract C. The reading of gages located above and below the water powers was continued through the year and also twice-a-day readings were taken of two permanent gages on the Seneca river and one on Cayuga lake.

Contract A.

R. W. Cady, Assistant Engineer, in charge. The work under this contract was let to Scott Bros., December 30, 1910, and was to have been completed on May 1, 1913, but the time was extended to October 1, 1913.

This contract has been modified by alterations as follows:

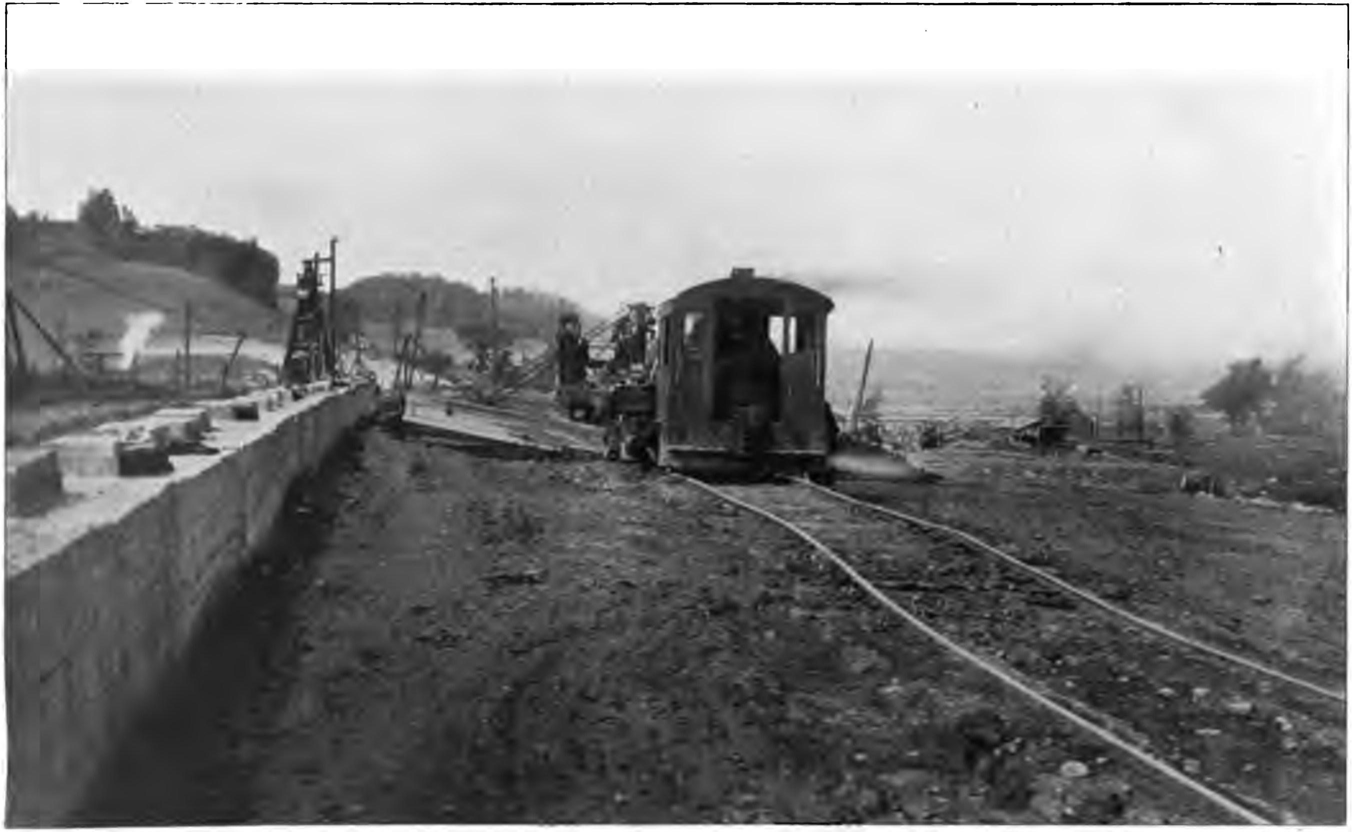
Alteration No. 1, approved by Canal Board November 1, 1911, changes method of constructing east wall of lock No. 1, to expedite work.

Alteration No. 2, approved by Canal Board September 10, 1912. provides stone-filled timber crib and extends riprap below Cayuga lake dam to prevent scour.

The concrete work on the lock and approach walls was completed and the lock-gates and lock-valves placed. The storehouse located between the lock and dam is nearly completed. At the retention dam, the east abutment and the two east piers and intermediate floor slabs were constructed, and the two Taintor gates erected. The coffer-dam for the west section of the dam was built last fall and during the present season the west abutment and the three west piers have been built as high as the level of the water surface.

The following table, including alterations to date, shows the progress of construction:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... lump sum	1	0	0	0	0
Excavation .... cu. yds.	72,480	11,191	57,167	15.4	79
Excavation (borrow pit) .... cu. yds.	12,000	0	0	0	0
Sheeting and bracing, first quality.... ft. B. M.	55,000	11,252	115,268	20.5	203
Sheeting and bracing, second quality. ft. B. M.	147,000	86,186	176,675	58.6	111.9
Forming embankment .... cu. yds.	10,920	0	0	0	0



BARGE CANAL, CONTRACT NO. 50.
Leveling embankment on the earthen portion of the dam at Hinckley reservoir. The core wall is shown at the left.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	22,000	16,495	16,495	74.9	74.9
White oak lumber in miter-sills ..... ft. B. M.	8,000	7,263	8,528	90.8	106.6
Foundation piles .... lin. ft.	10,400	15,310	23,764	147.2	228
Wooden sheet-piling .... ft. B. M.	121,500	10,320	52,962	8.5	43.5
First quality steel piling .... sq. ft.	23,300	0	22,758.33	0	97.7
Second-quality steel piling .... sq. ft.	50,200	21,629	44,564	43.3	88.9
Second-class concrete .... cu. yds.	23,400	4,774	19,995	20.4	85.5
Second-class riprap .... cu. yds.	1,580	410	582	26	36.8
Wrought iron pipe and specials .... lbs.	4,000	0	0	0	0
Structural steel .... lbs.	11,400	3,479	11,988	30.5	105.1
Metal reinforcement .... lbs.	40,900	2,552	9,973	6.2	24.4
Iron castings, plain .... lbs.	7,000	5,700	7,160	81.5	102.3
Iron castings, machined .... lbs.	7,400	0	6,461	0	87.3
Metal in lock-gates .... lbs.	196,000	178,698	190,714	91.1	97.2
Metal in buffer-beams .... lbs.	93,000	64,752	72,798	69.6	78.2
Metal in lock-valves .... lbs.	24,000	22,539	22,539	93.5	93.5
Metal in Taintor gates .... lbs.	325,800	98,190	98,190	30.1	30.1
Removing buildings .... No.	3	0	0	0	0
Coffer-dams, pumping, bailing and draining, lump sum	1	36.6%	86%	36.6	86
Storehouse .... No.	1	85%	85%	85	85
Maintaining navigation .... lump sum	1	0	0	0	0
Excavation and embankment outside of sheeting and bracing in lieu of sheeting and bracing .... lump sum	1	6%	98%	6	98
Sawed lumber, hemlock .... ft. B. M.	80,000	24,272	24,272	30.4	30.4
Stone filling in cribs .... cu. yds.	980	319	319	32.5	32.5
Coffer-dams, pumping, bailing and draining, alteration No. 2 .... lump sum	1	29.2%	29.2%	29.2	29.2

Contract B — Easterly Portion.

This contract was let to Cromwell-Sherman-Stalter Co. on December 29, 1910.

The contract has been modified by alterations as follows:

Alteration No. 1, approved by Canal Board November 28, 1911, changes alignment Sta. 5447 to Sta. 5622 to eliminate curvature.

Alteration No. 2, approved by Canal Board January 31, 1912, changes retaining wall and prism lines at Cayuga to conform to railroad changes.

Alteration No. 3, approved by Canal Board June 24, 1913, changes location of canal, Sta. 6456 to Sta. 6497 and Sta. 6587 to Sta. 6613, on account of soft material and to avoid damage to railroad.

The dredge *Clyde* continued excavating the prism between Mud lock and the north end of the contract, removing all of the material except some hard bars, which were left for another dredge to remove. In the spring of 1913 this dredge was taken to the lower end of Cayuga lake, where the machinery was removed and the hull sawed into three parts. The dredge was then moved up the canal and reassembled above Waterloo for use on the western portion of the contract.

At the present time a temporary dam, which is to be used to control the level of Cayuga lake is being built between Free bridge and Mud lock under an extra work order, dated September 10, 1913.

The hydraulic dredge *Lyons* and the dipper dredge *Erie* were moved down the river from contract No. 47 and are now ready to complete the eastern portion of contract B.

The following table, including alterations to date, shows the progress of construction on the eastern portion.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing........................lump sum	$750	27%	34%	27	34
Excavation........................cu. yds.	5,553,177	572,094	4,098,878	10.3	71.5
Forming embankment...............cu. yds.	1,000	0	0	0	0
Foundation piles...................lin. ft.	5,140	0	0	0	0
Second-class concrete...............cu. yds.	1,530	0	0	0	0
Wash wall........................cu. yds.	1,000	0	0	0	0
Second-class riprap.................cu. yds.	2,000	0	0	0	0
Fourth-class riprap.................cu. yds.	1,150	0	0	0	0
Bailing and draining of wall..........lin. ft.	600	0	0	0	0
Maintaining highway traffic........lump sum	$1,250	36%	40%	36	40
Maintaining navigation..............season	1	0	0	0	0

Contract C.

H. C. Smith, Assistant Engineer, in charge.

This contract was let to Larkin and Sangster on January 11, 1913, and work was begun during the first part of February. The spillway below lock No. 6 was moved down the stream about 1,200 feet and a coffer-dam built across the river below the site of the new locks. The site of the locks was unwatered and a steam-shovel has nearly completed the excavation for the two locks. The concrete foundations were built up to elevation 391.0 in the upper lock and about one-half the lower lock was built to the same elevation.

The concrete plant was started on July 29 and continued working every working day to date and in 55 days 27,900 cu. yds. of concrete were mixed in one 2-yd. mixer, or an average of 500 yds. per day of 16 hours each.

This contract has been modified by an alteration as follows:

Alteration No. 1, approved by Canal Board August 19, 1913, changes location of Ovid street bridge abutments to avoid appropriation of expensive property.

The following table, including one alteration, shows the progress of construction.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... lump sum	1	0	0	0	0
Excavation .... cu. yds.	352,400	77,721	77,721	22	22
Forming embankment .... cu. yds.	38,200	0	0	0	0
Lining .... cu. yds.	216	0	0	0	0
Sawed lumber, yellow pine .... ft. B. M.	3,000	0	0	0	0
White oak lumber in miter-sills .... ft. B. M.	2,400	0	0	0	0
Foundation piles .... lin. ft.	36,000	0	0	0	0
Wooden sheet-piling .... ft. B. M.	129,000	0	0	0	0
Second-class concrete .... cu. yds.	132,100	27,949	27,949	21.1	21.1
First-class masonry bridge coping .... cu. yds.	5.7	0	0	0	0
Structural steel .... lbs.	19,400	0	0	0	0
Metal reinforcement .... lbs.	34,000	19,436	19,436	57.2	57.2
Bronze .... lbs.	1,500	0	0	0	0
Steel castings, plain .... lbs.	13,100	520	520	3.96	3.96
Steel castings, machined .... lbs.	1,000	0	0	0	0
Iron castings, plain .... lbs	17,500	0	0	0	0
Iron castings, machined .... lbs.	70,000	0	0	0	0
Portland cement sidewalks .... sq. ft.	6,580	0	0	0	0
Concrete curbs .... lin. ft.	1,220	0	0	0	0
Brick pavement .... sq. yds.	2,030	0	0	0	0
Wooden fence .... lin. ft.	660	0	0	0	0
Wrought iron pipe railing .... lin. ft.	2,250	0	0	0	0
Coffer-dams, pumping, bailing and draining, lump sum	1	14%	14%	14	14
Sheeting and bracing .... ft. B. M.	12,300	0	0	0	0
Flagstone sidewalks relaid .... sq. yds.	62	0	0	0	0

Contract II.

L. L. Hadley, Assistant Engineer, in charge.

Contract H, New York State Dredging Corporation, contractors, was let on December 22, 1911, and was supposed to have been completed on January 1, 1913.

This contract has been modified by alterations as follows:

Alteration No. 1, approved by Canal Board January 11, 1912, provides dock wall and turning basin at Ithaca harbor to facilitate navigation.

Alteration No. 2, approved by Canal Board September 25, 1912, provides basin at entrance from Cayuga lake to facilitate navigation, and for moving Cornell boat-house to avoid interference with dock.

The dredge *Ithaca,* a 20-inch hydraulic suction dredge, was completed and began work during October, 1912, and continued until February 7, 1913, when cold weather caused a cessation of dredging until April 1, 1913. The entire dredging work on the contract was practically completed on June 30 and the dredge has since been tied up, waiting for the completion of the terminal dock, when the remaining excavation will be finished.

The following table, including alterations to date, shows the progress of construction:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.........................cu. yds.	778,700	771,498	771,498	99.1	99.1
Removing old crib.................cu. yds.	3,644	3,475	3,475	95.2	95.2
Foundation piles.....................lin. ft.	1,000	1,934	1,934	193.4	193 4
Fender piles, 30 ft. long.................No.	1,800	0	0	0	0
Sawed lumber......................ft. B. M.	486,000	447,859	447,859	92.3	92.3
Stone filling.........................cu. yds.	5,734	6,504	6,504	114	114
Second-class concrete................cu. yds.	3,726	2,554	2,554	68.5	63 5
Moving ice house..................lump sum	0	0	0	0	0
Iron castings, plain.......................lbs.	1,300	0	0	0	0
Moving Cornell boathouse.................	0	0	0	0	0
Embankment........................cu. yds.	2,200	902	902	41	41
Moving Cornell boathouse, alteration No. 2, lump sum	1	85%	85%	85	85

CAYUGA AND SENECA CANAL, RESIDENCY NO. 2.

Resident Engineer A. E. Steere reports:

This residency extends from a point east of Waterloo to deep water in Seneca lake and from deep water in Seneca lake to Ayers street, Montour Falls, embracing contracts E and I and the westerly portions of contract B, D and F.

Contract E.

Appropriation maps and surveys were made previous to awarding this contract.

Contract E was awarded to Cleveland and Sons Co. of Brockporton, January 7, 1913, and comprises the construction of lock No. 4 and approach walls, dam, bridge and guard-gates at Waterloo.

Thos. R. Tetley, Jr., Assistant Engineer, is in charge.

Fourteen buildings were removed from the site. A Lidgerwood excavator with locomotives and cars started work at the lower approach wall at Sta. 2423 + 16 on May 28. Subsequently a cut comprising earth and loose rock was continued to Sta. 6429, then turning back a cut was made in solid rock to approximate grade, material being spoiled on areas provided.

Coffer-dams were constructed between the Becker and Patterson islands and at a point east of the Sash and Door Factory the site for the easterly portion of the Locust street bridge and dam was unwatered. Excavation with a "Browning" and a derrick equipped with a clam shell has been in progress at the site of the Locust street bridge and dam, earth and rock being removed.

A portion of the north abutment of the Washington street bridge and retaining wall was built across the saw-mill race; also the east wing of the south abutment has been completed.

A foot-bridge across the lock site has been maintained for pedestrians.

The following table shows the amounts and percentages of work done during the year and the total work done to the end of the fiscal year:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing . . . . . lump sum	$50	$40	$40	80	80
Excavation . . . . . cu. yds.	107,000	25,528	25,528	23.8	23.8
Forming embankment . . . . . cu. yds.	12,400	141	141	1.1	1.1
Lining . . . . . cu. yds.	370	0	0	0	0
Sawed lumber, yellow pine . . . . . ft. B. M.	400	0	0	0	0
White oak lumber in miter-sills . . . . . ft. B. M.	4,000	0	0	0	0
Second-class concrete . . . . . cu. yds.	21,200	111	111	0.5	0.5
First-class reinforced concrete . . . . . cu. yds.	630	0	0	0	0
Second-class reinforced concrete . . . . . cu. yds.	950	0	0	0	0
First-class masonry bridge coping . . . . . cu. yds.	2.2	0	0	0	0
Cobblestone paving . . . . . cu. yds.	180	0	0	0	0
Fourth-class riprap . . . . . sq. yds.	110	0	0	0	0
Structural steel . . . . . lbs.	84,900	0	0	0	0
Metal reinforcement . . . . . lbs.	44,500	0	0	0	0
Bronze . . . . . lbs.	1,500	0	0	0	0
Steel castings, machined . . . . . lbs.	1,000	0	0	0	0
Iron castings, plain . . . . . lbs.	6,600	0	0	0	0
Iron castings, machined . . . . . lbs.	20,600	0	0	0	0
Portland cement sidewalks . . . . . sq. ft.	3,400	0	0	0	0
Concrete curbs . . . . . lin. ft.	740	0	0	0	0
Wooden fence . . . . . lin. ft.	770	0	0	0	0
Wrought iron pipe railing . . . . . lin. ft.	185	0	0	0	0
Maintaining highway traffic . . . . . lump sum	$2,000	$240	$240	12	12
Balustrade . . . . . lin. ft.	510	0	0	0	0
Bituminous surfacing . . . . . sq. yds.	450	0	0	0	0
Coffer-dams, pumping, bailing and draining. lump sum	$10,000	$800	$800	8	8
Removing buildings . . . . . No.	31	. . . .	. . . .	. . . .	. . . .
Gross estimate	$347,216 50	$23,950	$23,950	6.9	6.9

NOTE.— Buildings on this contract disposed of by Superintendent of Public Works.

Contract B — Westerly Portion.

Crowell-Sherman-Stalter Co. of Cleveland, Ohio, are the contractors. H. A. Gehring, Assistant Engineer, is in charge.

The westerly portion of this contract comprises the excavation of the canal from Waterloo to deep water in Seneca lake, a length of five miles.

A statement of alterations on this contract is given in the report of Residency No. 1.

The work on this contract consisted of preliminary work until the latter part of January, 1913, when the contractor started to erect buildings and construct a spur track from the Lehigh Valley railroad. The prism was cleared and brush burned during the month of February.

The dredge *Clyde* was dismantled, the hull cut into three parts, the bulkheads strengthened, and subsequently the parts towed from the bank of Cayuga lake through the locks and canal to the Cook property west of Waterloo. These sections were hauled up on the ways about the first of July, reassembled and launched on July 21.

The excavation was started on August 12 at Sta. 6475; continuing to Sta. 6466 + 40 on August 20, when the dredge turned around and moved to Sta. 6670, immediately below the guard lock. Dredging operations, commencing there, continued in an easterly direction, reaching Sta. 6614 on September 30.

The following table, including alterations and increases as authorized by the Canal Board, shows the amounts and percentages of work done during the year and the total work done to the end of the fiscal year:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... lump sum	$750	$150	$150	20	20
Excavation .... cu. yds.	904,573	171,024	171,024	18.8	18.8
Excavating old masonry .... cu. yds.	1,250	0	0	0	0
Maintaining highway traffic .... lump sum	$1,250	0	0	0	0
Maintaining navigation .... 2 seasons	$30,000	$3,000	$3,000	10	10
Deduct for metal in guard-gates .... lump sum	$100	0	0	0	0
Gross estimate	$223,310	$39,060	$39,060	17.4	17.4

NOTE:— These items represent the portion of the preliminary estimate appearing on the westerly portion of contract B.

Contract I.

This contract was awarded to the Central Dredging Co. of Cleveland, Ohio, on September 23, 1912. E. S. Overbaugh, Assistant Engineer, is in charge.

A survey party continued making appropriation surveys, laying out construction base line and preparing appropriation maps, setting monuments, etc.

The dredge *Hudson* was delivered in barges at Watkins on November 17 and its erection was commenced immediately thereafter. It started excavating for the Y-line on April 8 and subsequently this portion has been practically completed.

The main line has been excavated to grade from deep water, at Sta. 4, to Sta. 11 and from Sta. 115 to Sta. 124. A preliminary cut was made from Sta. 11 to Sta. 115 on the main line, leaving from two to three feet of material above grade.

The old canal swing bridge near Sta. 20 was lengthened 14 feet to permit passing the dredge and coal barges and has been used for maintaining highway traffic.

The following table shows the amounts and percentages of work done during the year and the total done to the end of the fiscal year:

ITEMS OF WORK.		Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation	cu. yds.	1,144,400	783,926	783,926	68.5	68.5
Forming embankment	cu. yds.	2,700	0	0	0	0
Third-class riprap	cu. yds.	6,330	0	0	0	0
Maintaining highway traffic	lump sum	$2,000	$600	$600	30	30
Gross estimate		$215,639	$135,820	$135,820	63	63
Extra work order dated March 4, 1913		$300	$300	$300	100	Finished

Contract D — Westerly Portion.

The westerly portion of this contract consists in excavating the canal prism between Seneca Falls and contract E at Waterloo and from the west end of contract E to the easterly end of contract B at Sta. 6649.

A small amount of work consisting of appropriation surveys has been done during the year.

Contract F — Westerly Portion.

This contract comprises the construction of bridges, lock-gates, etc., on the Cayuga and Seneca canal.

The work on this portion of the contract has been of a preliminary nature. Surveys and maps have been prepared for the bridges mentioned below by the assistant engineers whose contracts include the various bridge locations.

Kingdom road, Sta. 6320 + 60; Gorham street, Sta. 6397 + 30; Race street, Sta. 6409; Washington street, Waterloo, Sta. 6426; Lake road near Geneva, Sta. 6688 and Fourth street, Watkins, Sta. 20.

Plans for this work are in progress in Albany.

Chemung Canal Survey.

Resident Engineer Louis A. Burns reports:

Chapter 220 of the Laws of 1913, which is an act concerning the canal system of the State, authorizes what is called the " Chemung Canal " survey.

This work is being done to determine the cost of constructing a suitable connection between the Barge canal system and the waterway improvements contemplated by the State of Pennsylvania. The chief purpose of this coöperation would be to facilitate the transportation of coal. To accomplish this, the abandoned canals from Seneca lake to the coal fields must be reconstructed.

The Chemung canal was formerly operated between Watkins, at the south end of Seneca lake, and Elmira on the Chemung river, which is a branch of the Susquehanna. From Elmira, what was known as the Junction canal extended down the Chemung river to the State line near Waverly, where it met the North Branch canal, which reached southerly into Pennsylvania. The summit level of the Chemung canal was about six miles north of, and approximately fifty feet higher than the Chemung river at Elmira. Consequently, a feeder sixteen miles in length was required, in order that the river might be tapped farther upstream, where a pool of sufficient elevation could be formed. This feeder was navigable and, leaving the Chemung river near Corning, it entered the summit level in the village of Horseheads. The water-supply of the Junction canal was a simpler matter, because this waterway was composed of constantly descending levels that were below the Chemung canal.

On May 14, 1913, field work was begun on the Chemung canal survey at Montour Falls. This place is about two miles south of Seneca lake and is now being connected to that body of water by a branch of the Barge canal. All of the ground that appeared feasible for canal location along the route of the abandoned waterways was covered by a topographic survey. The distance from Montour Falls to the Pennsylvania line near Waverly is thirty-eight miles, and this part of the field work was finished on September 27.

At present a survey is being made to determine the proper location for a feeder from Horseheads to the Chemung river above Elmira and the topography of the river itself is being taken at such places as appear suitable for the dam and pool necessary for this feeder.

Before the field work is completed, the character of the subsoil along the routes will be determined by such borings as are necessary. The topographic maps, by means of which the estimate is to be made, will show the ground surface and other features with sufficient detail, so that, when the canal routes and structures have been projected upon these maps, the various items of construction can readily be computed. The problem of supplying water to operate the proposed canal will be considered in detail, and the cost of supplementing the flow of the Chemung river during the low-water period will be estimated.

THE FOLLOWING STATEMENTS SHOW THE NAMES, RANK AND COMPENSATION OF ENGINEERS EMPLOYED IN THE MIDDLE DIVISION OF THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES, FOR THE FISCAL YEAR ENDED SEPTEMBER 30, 1913.

Ordinary Repairs to Canals — Erie Canal.

Chapter 546, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy Moulton	First resident engineer	$250 per month	$375 00	$12 44	$387 44
I. S. Badger	Assistant engineer	6 00 per day	30 00	6 00	36 00
R. K. Sheldon	Assistant engineer	6 00 per day	12 00		12 00
T. R. Hazelum	Assistant engineer	6 00 per day	36 00		36 00
C. F. Hopstein	Draftsman	5 00 per day	210 00	49 53	259 53
A. E. Green	Draftsman	150 per month	13 33		13 33
H. Auerbach	Draftsman	150 per month	53 23		53 23
W. S. McDowell	Draftsman	150 per month	23 33		23 33
F. C. Curtin	Leveler	4 50 per day	27 00	8 19	35 19
M. J. Chryst	Rodman	4 00 per day	16 00		16 00
J. S. Bierhardt	Rodman	4 00 per day	24 00		24 00
E. T. Gawkins	Rodman	3 50 per day	230 50		230 50
J. M. Barney	Rodman	3 50 per day	3 50		3 50
W. S. Morris	Estimate clerk	150 per month		12 06	12 06
George B. Kelley	Chauffeur	100 per month	396 61	17 00	413 61
John Kelley	Chauffeur	100 per month	400 00	8 96	408 96
John Pendergast	Fireman	75 per month	196 65		196 65
Ferdinand Smith	Laborer	2 00 per day	626 00		626 00
C. H. Norton	Laborer	2 00 per day	414 00		414 00
Henry Turk	Laborer	2 00 per day	54 00		54 00
C. E. Van Brocklin	Laborer	2 00 per day	12 00		12 00
			$3,153 15	$114 18	$3,267 33
Incidental Expenses.					
Stationery and printing				$53 50	
Livery				1 00	
Fuel and light				334 00	
Postage				133 30	
Telephone and telegraph				854 69	
Miscellaneous				4,067 01	
					5,443 50
Total					$8,710 83

Ordinary Repairs to Canals — Black River Canal.

Chapter 546, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy Moulton	First resident engineer	$250 per month	$25 00	$8 91	$33 91
R. K. Sheldon	Assistant engineer	6 00 per day	30 00	17 76	47 76
F. C. Curtin	Leveler	4 50 per day	30 00	25 05	55 05
J. S. Bierhardt	Rodman	4 00 per day	28 00		28 00
John Kelley	Chauffeur	100 per month	100 00	1 60	101 60
C. E. Van Brocklin	Laborer	2 00 per day	2 00		2 00
			$215 00	$53 32	$268 32
Incidental Expenses.					
Livery				$2 50	
Miscellaneous				18 35	
					20 85
Total					$289 17

Construction of Barge Canal — Erie Canal.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edwin Styring	Division engineer	$400 per month	$1,700 00	$220 83	$1,920 83
Guy Moulton	First resident engineer	250 per month	1,400 00	45 51	1,445 51
L. C. Hulburd	Resident engineer	250 per month	3,000 00	245 85	3,245 85
Harry J. Morrison	Resident engineer	250 per month	3,000 00	79 92	3,079 92
Earle Talbot	Resident engineer	250 per month	1,500 00	56 08	1,556 08
Edward J. Berry	Resident engineer	250 per month	3,000 00	359 63	3,359 63
D. C. Wedgeworth	Resident engineer	250 per month	3,000 00	76 85	3,076 85
John D. Scanlon	Cashier	150 per month	1,200 00	....	1,200 00
W. S. Morris	Estimate clerk	150 per month	450 00	1 75	451 75
Harvey Wagner	Stenographer	125 per month	750 00	....	750 00
L. J. Mulhauser	Stenographer	125 per month	1,500 00	....	1,500 00
A. B. Dewey	Confidential stenographer	125 per month	375 00	....	375 00
John Kelley	Chauffeur	100 per month	....	22 33	22 33
C. F. Hopstein	Draftsman	5 00 per day	855 00	135 84	990 84
E. Mercer Weiskotten	Draftsman	4 00 per day	108 00	2 08	110 08
J. J. Ryan	Draftsman	4 00 per day	1,252 00	....	1,252 00
H. W. Baker	Draftsman	4 00 per day	436 00	....	436 00
H. M. Cox	Draftsman	4 00 per day	128 00	....	128 00
R. M. Fraser	Draftsman	5 00 per day	1,595 00	47 11	1,642 11
C. G. Lamphere	Draftsman	4 00 per day	1,350 00	12 40	1,362 40
A. F. Dardis	Tracer	60 per month	276 77	....	276 77
John H. Forth	Tracer	83 33 per month	266 12	3 96	270 08
R. K. Sheldon	Assistant engineer	6 00 per day	1,632 00	446 15	2,078 15
Carl L. Bannister	Assistant engineer	6 00 per day	576 00	2 10	578 10
Irvin S. Badger	Assistant engineer	5 00 per day	977 00	67 13	1,044 13
Charles W. Costello	Assistant engineer	6 00 per day	2,061 00	65 62	2,126 62
H. A. Gehring	Assistant engineer	6 00 per day	1,116 00	41 56	1,157 56
D. J. Levinson	Assistant engineer	5 50 per day	1,814 00	....	1,814 00
George H. Briggs	Assistant engineer	6 00 per day	2,018 00	80 50	2,098 50
C. R. Chase	Assistant engineer	6 00 per day	2,189 00	321 07	2,510 07
R. E. Swinney	Assistant engineer	5 00 per day	1,750 00	....	1,750 00
Daniel B. Donovan	Assistant engineer	7 00 per day	2,303 00	35 46	2,338 46
Foster B. Crocker	Assistant engineer	6 00 per day	2,028 00	540 85	2,568 85
H. J. O'Neil	Assistant engineer	6 00 per day	2,016 00	354 64	2,370 64
Walter F. Shaw	Assistant engineer	5 00 per day	1,716 00	27 54	1,743 54
J. L. Bush	Assistant engineer	6 00 per day	1,878 00	10 90	1,888 90
R. W. Smith	Assistant engineer	5 00 per day	1,769 00	226 45	1,995 45
E. C. Olcott	Assistant engineer	6 00 per day	954 00	81 60	1,035 60
W. S. Saxton	Assistant engineer	6 00 per day	1,895 50	....	1,895 50
H. C. Smith	Assistant engineer	6 00 per day	750 00	72 85	822 85
W. J. Durkan	Assistant engineer	6 00 per day	1,988 00	182 10	2,180 10
J. G. Palmer	Assistant engineer	6 00 per day	1,956 00	240 28	2,196 28
R. R. Stuart	Assistant engineer	6 00 per day	396 00	....	396 00
A. G. Crysler	Assistant engineer	6 00 per day	114 00	1 15	115 15
S. M. Stuart	Assistant engineer	6 00 per day	786 00	....	786 00
J. L. Southworth	Assistant engineer	5 00 per day	637 00	....	637 00
Joseph Wechsler	Assistant engineer	5 00 per day	245 00	....	245 00
R. C. Hunter	Assistant engineer	5 00 per day	400 00	....	400 00
P. C. Gallup	Assistant engineer	5 00 per day	210 00	....	210 00
C. H. Adams	Leveler	4 50 per day	1,257 50	....	1,257 50
B. A. Krotinger	Leveler	4 50 per day	1,453 50	....	1,453 50
Charles Donohue	Leveler	5 00 per day	1,595 00	....	1,595 00
Joseph Wechsler	Leveler	4 50 per day	927 00	....	927 00
H. J. Stevens	Leveler	4 50 per day	1,556 50	....	1,556 50
N. R. McLoud	Leveler	5 00 per day	1,750 00	323 49	2,073 49
W. H. Hilborn	Leveler	5 00 per day	35 00	....	35 00
J. A. Sloat	Leveler	5 00 per day	1,484 50	....	1,484 50
G. H. Thomas	Leveler	4 50 per day	1,399 50	20 65	1,420 15
John J. Gawkins	Leveler	4 50 per day	1,359 00	12 00	1,371 00
George F. Baker	Leveler	4 50 per day	1,341 00	....	1,341 00
Jacob Gadlowitz	Leveler	4 50 per day	738 00	....	738 00
L. H. Coit	Leveler	4 50 per day	1,309 50	....	1,309 50
B. A. Reddington	Leveler	4 50 per day	1,233 00	....	1,233 00
E. C. Neudecker	Leveler	4 50 per day	540 00	....	540 00
L. R. Bennett	Leveler	4 50 per day	576 00	....	576 00
Israel H. Platt	Leveler	4 50 per day	346 50	....	346 50
F. C. Curtin	Leveler	4 50 per day	279 00	3 55	300 55
Mathew J. Chryst	Rodman	4 00 per day	1,099 00	9 32	1,108 32
D. A. McClellan	Rodman	3 50 per day	185 50	....	185 50
C. V. O'Malley	Rodman	3 50 per day	1,199 00	....	1,199 00
Morris Strauss	Rodman	3 50 per day	175 00	....	175 00

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
P. C. Gallup	Rodman	$4 00 per day	$1,096 00		$1,096 00
J. L. Doyle	Rodman	4 00 per day	171 00		171 00
E. C. Neudecker	Rodman	3 50 per day	682 50		682 50
L. R. Bennett	Rodman	4 00 per day	788 00		788 00
Don A. Wilcox	Rodman	4 00 per day	1,304 00		1,304 00
L. A. Heuquenbourg	Rodman	4 00 per day	1,308 00		1,308 00
H. R. Topping	Rodman	3 50 per day	1,151 00		1,151 00
Paul T. Wheeler	Rodman	3 50 per day	1,141 00		1,141 00
W. Newton Edwards	Rodman	3 50 per day	1,095 50		1,095 50
J. P. Mullen	Rodman	3 50 per day	1,134 00		1,134 00
A. R. Patchke	Rodman	4 00 per day	1,264 00		1,264 00
G. H. Thomas	Rodman	4 00 per day	108 00		108 00
J. J. Phalen	Rodman	3 50 per day	430 50		430 50
John J. Gawkins	Rodman	3 50 per day	112 00	$15 38	127 38
George F. Baker	Rodman	3 50 per day	94 50		94 50
J. L. Dowd, Jr	Rodman	3 50 per day	1,130 50		1,130 50
J. S. Bierhardt	Rodman	4 00 per day	1,004 00		1,004 00
Powell Wall	Rodman	3 50 per day	94 50		94 50
Casper M. Connery	Rodman	3 50 per day	133 00		133 00
Clarence L. Fox	Rodman	3 50 per day	1,120 00		1,120 00
L. H. Coit	Rodman	4 00 per day	116 00		116 00
Edgar N. Scott	Rodman	3 50 per day	1,064 00		1,064 00
W. H. Boigeol	Rodman	4 00 per day	1,260 00		1,260 00
Grover A. Woodard	Rodman	3 50 per day	864 50		864 50
E. C. Ainsley	Rodman	3 50 per day	850 50		850 50
H. W. Grow	Rodman	3 50 per day	1,151 00		1,151 00
James T. Phalan	Rodman	3 50 per day	444 50		444 50
H. C. Smith	Rodman	3 50 per day	1,318 50		1,318 50
A. A. Patterson	Rodman	3 50 per day	1,158 50		1,158 50
D. E. Robbins	Rodman	3 50 per day	490 00		490 00
A. F. Dardis	Rodman	3 50 per day	402 50		402 50
Roy E. Homan	Rodman	3 50 per day	399 00		399 00
Isaac Kaufman	Rodman	3 50 per day	294 00		294 00
William W. Pragnell	Rodman	3 50 per day	259 00	11 10	270 10
F. W. Kinney	Rodman	3 50 per day	351 75		351 75
Hardin D. Thweatt	Rodman	3 50 per day	311 50		311 50
Joseph Morgan	Rodman	3 50 per day	301 00		301 00
H. P. Heffernan	Rodman	3 50 per day	374 50		374 50
Guy L. Smith	Rodman	3 50 per day	381 50		381 50
Lynn B. Curry	Rodman	3 50 per day	329 00		329 00
Ivan C. Hall	Rodman	3 50 per day	318 50		318 50
F. P. Ulrich	Rodman	3 50 per day	157 50		157 50
Leo H. Schwarts	Rodman	3 50 per day	252 00		252 00
B. V. Corcoran	Rodman	3 50 per day	231 00		231 00
E. B. Amidon	Rodman	3 50 per day	245 00		245 00
L. H. Bernstein	Rodman	3 50 per day	147 00		147 00
Dennis B. Lynch	Rodman	3 50 per day	84 00		84 00
J. M. Barney	Rodman	3 50 per day	21 00		21 00
F. C. Curtin	Chainman	3 00 per day	519 00		519 00
Edward T. Gawkins	Chainman	3 00 per day	495 00		495 00
Morris Strauss	Chainman	2 50 per day	7 50		7 50
W. J. Curtis	Chainman	3 00 per day	993 00		993 00
James P. Mullen	Chainman	3 00 per day	9 00		9 00
Henry Ten Hagen	Chainman	2 50 per day	50 00		50 00
Frank Luts	Chainman	3 00 per day	942 00		942 00
E. G. Warner	Chainman	3 00 per day	957 00		957 00
Henry C. Little	Chainman	3 00 per day	630 00	50 26	680 26
John L. Dowd, Jr	Chainman	2 50 per day	7 50		7 50
L. A. Kavanagh	Chainman	3 00 per day	939 00	7 80	946 80
Howard W. Loftus	Chainman	2 50 per day	787 50		787 50
Clarence L. Fox	Chainman	3 00 per day	9 00		9 00
Roy E. Homan	Chainman	3 00 per day	621 00		621 00
D. E. Robbins	Chainman	2 50 per day	446 00		446 00
John Olcott	Chainman	2 50 per day	400 00		400 00
W. M. Jackson	Chainman	2 50 per day	80 00		80 00
Graydon R. Davis	Chainman	2 50 per day	42 50		42 50
William H. Barhyte	Chainman	2 50 per day	318 00		318 00
Thomas Farrell	Chainman	2 50 per day	352 50		352 50
R. E. Gallavin	Chainman	3 00 per day	855 00		855 00
Karl K. Schulte	Chainman	2 50 per day	107 50		107 50
A. F. Dardis	Chainman	2 50 per day	145 00		145 00
A. A. Vickers	Chainman	3 00 per day	24 00		24 00

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Dennis B. Lynch	Chainman	$2 50 per day	$280 00	....	$280 00
Frank Corey	Chainman	2 50 per day	307 50	....	307 50
William Smutzler	Chainman	2 50 per day	278 00	....	278 00
F. R. Ulrich	Chainman	2 50 per day	82 50	....	82 50
Henry Eisen	Chainman	2 50 per day	165 00	....	165 00
C. W. Diefendorf	Masonry inspector	5 00 per day	1,605 00	....	1,605 00
William Heimann, Jr.	Masonry inspector	3 50 per day	108 50	....	108 50
Alfred Evans	Masonry inspector	5 00 per day	1,625 00	....	1,625 00
Frank DeVall	Masonry inspector	4 00 per day	1,209 50	....	1,209 50
A. H. Hallenbeck	Masonry inspector	5 00 per day	815 00	....	815 00
Albert V. Markham	Masonry inspector	3 50 per day	14 00	....	14 00
F. J. Lynch	Laborer	2 00 per day	416 00	....	416 00
L. C. Ryan	Laborer	2 00 per day	54 00	....	54 00
Daniel B. Donovan	Laborer	2 00 per day	108 00	....	108 00
Joseph Reh	Laborer	2 00 per day	626 00	....	626 00
William P. Rayland	Laborer	2 00 per day	106 00	....	106 00
Clarence Phelps	Laborer	2 00 per day	702 00	....	702 00
A. F. Dardis	Laborer	2 00 per day	54 00	....	54 00
Henry Akins	Laborer	2 00 per day	628 00	....	628 00
G. H. Krug	Laborer	2 00 per day	12 00	....	12 00
Arthur Mengel, Jr	Laborer	2 00 per day	12 00	....	12 00
George Grogan	Laborer	2 00 per day	648 00	....	648 00
William Spencer	Laborer	2 00 per day	12 00	....	12 00
John Copia	Laborer	2 00 per day	632 00	....	632 00
James Cross	Laborer	2 00 per day	628 00	....	628 00
Albert Brown	Laborer	2 00 per day	628 00	....	628 00
William Farrier	Laborer	2 00 per day	628 00	....	628 00
Herbert Hitchings	Laborer	2 00 per day	638 00	....	638 00
James Keating	Laborer	2 00 per day	480 00	....	480 00
Arthur Johnson	Laborer	2 00 per day	284 00	....	284 00
Bernard Steinberg	Laborer	2 00 per day	370 00	....	370 00
Otis Van Wie	Laborer	2 00 per day	334 00	....	334 00
John Dygert	Laborer	2 00 per day	626 00	....	626 00
Earl M. Willis	Laborer	2 00 per day	16 00	....	16 00
Wm. T. Tanner, Jr	Laborer	2 00 per day	434 00	....	434 00
Thos. F. Nugent	Laborer	2 00 per day	168 00	....	168 00
James Maroney	Laborer	2 00 per day	378 00	....	378 00
Dennis Murray	Laborer	2 00 per day	356 00	....	356 00
Francis Daly	Laborer	2 00 per day	98 00	....	98 00
Henry Turk	Laborer	2 00 per day	210 00	....	210 00
Charles Oliver	Laborer	2 00 per day	220 00	....	220 00
Frank McCarthy	Laborer	2 00 per day	258 00	....	258 00
W. M. Brewer	Laborer	2 00 per day	76 00	....	76 00
Chas. Sponenburg	Laborer	2 00 per day	242 00	....	242 00
Thomas Gray	Laborer	2 00 per day	402 00	....	402 00
Daniel Kilmore	Laborer	2 00 per day	206 00	....	206 00
Edward Weis	Laborer	2 00 per day	242 00	....	242 00
James F. Griffin	Laborer	2 00 per day	236 00	....	236 00
Raymond Gaydor	Laborer	2 00 per day	240 00	....	240 00
Arthur Preston	Laborer	2 00 per day	234 00	....	234 00
Archie Hall	Laborer	2 00 per day	204 00	....	204 00
Clark H. Norton	Laborer	2 00 per day	158 00	....	158 00
Robert Williams	Laborer	2 00 per day	118 00	....	118 00
Arnold Hooper	Laborer	2 00 per day	128 00	....	128 00
Laurea N. Borst	Laborer	2 00 per day	28 00	....	28 00
John G. Yates	Laborer	2 00 per day	154 00	....	154 00
George Hanna	Laborer	2 00 per day	54 00	....	54 00
Leon Beauloc	Laborer	2 00 per day	158 00	....	158 00
Dominick Forati	Laborer	2 00 per day	42 00	....	42 00
Andrew Andreoch	Laborer	2 00 per day	42 00	....	42 00
John McLean	Laborer	2 00 per day	58 00	....	58 00
Leonard Miscall	Laborer	2 00 per day	118 00	....	118 00
T. Howard Stott	Laborer	2 00 per day	142 00	....	142 00
W. H. Wilson	Laborer	2 00 per day	68 00	....	68 00
George Phillips	Laborer	2 00 per day	12 00	....	12 00
L. H. Washburn	Laborer	2 00 per day	50 00	....	50 00
Asa Farnsworth	Laborer	2 00 per day	46 00	....	46 00
Wm. Harrigan	Laborer	2 00 per day	20 00	....	20 00
T. B. Bowes	Foreman	4 50 per day	234 00	....	234 00
Warden T. Marriott	Axeman	2 50 per day	790 00	....	790 00
A. W. Bischell	Axeman	2 00 per day	640 00	....	640 00
C. E. Van Brocklin	Laborer	2 00 per day	250 00	....	250 00

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
George B. Kelley	Laborer	$2 00 per day	$190 00		$190 00
J. H. Whalen, Jr	Laborer	2 00 per day	78 00		78 00
R. A. Davis	Laborer	2 00 per day	236 00		236 00
Joseph F. O'Brien	Boatman	3 00 per day	996 00		996 00
G. R. Stedman	Boatman	3 00 per day	525 00		525 00
E. P. Downer	Boatman	3 00 per day	168 00		168 00
Frank Ladd	Boatman	3 00 per day	975 00		975 00
Oscar Svenson	Boatman	3 00 per day	945 00		945 00
William Biehler	Boatman	3 00 per day	159 00		159 00
F. W. Kinney	Boatman	3 00 per day	292 50	$1 90	294 40
Daniel Kilmore	Boatman	3 00 per day	540 00		540 00
Fred Sweet	Boatman	3 00 per day	939 00		939 00
Thomas Gray	Boatman	3 00 per day	159 00		159 00
Charles Sponenburg	Boatman	3 00 per day	594 00		594 00
W. M. Brewer	Boatman	3 00 per day	42 00		42 00
Morris Schrell	Boatman	3 00 per day	393 00		393 00
Frank McCarthy	Boatman	3 00 per day	393 00		393 00
Charles Coffinger	Boatman	3 00 per day	348 00		348 00
Harry Eilen	Boatman	3 00 per day	306 00		306 00
James Keating	Boatman	3 00 per day	219 00		219 00
William Prettie	Gage reader	10 per month	120 00		120 00
William H. Burns	Gage reader	5 per month	60 00		60 00
Mark Quimby	Gage reader	5 per month	60 00		60 00
J. H. Rupert	Gage reader	5 per month	20 00		20 00
A. C. Carr	Gage reader	5 per month	45 00		45 00
Floyd Bettinger	Gage reader	7 per month	7 00		7 00
Daniel Brown	Gage reader	7 per month	84 00		84 00
Marie Brandt Brown	Gage reader	7 per month	84 00		84 00
W. T. Crill	Gage reader	7 per month	84 00		84 00
Tally Goodfellow	Gage reader	7 per month	21 00		21 00
Charles Goodfellow	Gage reader	10 per month	90 00		90 00
Mrs. A. H. Hoffmeister	Gage reader	7 per month	84 00		84 00
Clyde Judge	Gage reader	7 per month	45 50		45 50
John Carroll	Gage reader	7 per month	21 00		21 00
A. H. LaFevre	Gage reader	7 per month	84 00		84 00
Arthur Mason	Gage reader	7 per month	84 00		84 00
Maria Powell	Gage reader	7 per month	84 00		84 00
Henry Straub	Gage reader	7 per month	10 50		10 50
O. D. Merwin	Gage reader	7 per month	21 00		21 00
Griff T. Williams	Gage reader	7 per month	84 00		84 00
John Phillips	Gage reader	6 per month	72 00		72 00
W. S. Dunn	Gage reader	5 per month	60 00		60 00
Chris Hannon	Gage reader	4 per month	48 00		48 00
Charles Brannock	Gage reader	10 per month	120 00		120 00
Louis McArthur	Gage reader	10 per month	120 00		120 00
John R. Hiller	Gage reader	7 per month	84 00		84 00
Charles Burke	Gage reader	5 per month	60 00		60 00
John Chamberlain	Gage reader	5 per month	60 00		60 00
George Heagle	Gage reader	5 per month	60 00		60 00
Mark Kennedy	Gage reader	5 per month	60 00		60 00
L. W. Moulton	Gage reader	5 per month	60 00		60 00
Frank Shane	Gage reader	5 per month	60 00		60 00
W. S. Birnie	Livery			352 00	352 00
Bernard Kelly	Livery			15 00	15 00
Mets Motor Sales Co.	Livery			121 00	121 00
Swanscott Miller Auto Company	Livery			356 75	356 75
Charles Lafever	Livery			491 00	491 00
Bowen Brothers	Livery			140 00	140 00
Windsor House Livery	Livery			45 00	45 00
C. L. Hickland	Livery			661 00	661 00
B. D. Roark	Livery			429 50	429 50
Frank Hanbray	Livery			388 50	388 50
H. G. Donovan	Livery			896 00	896 00
L. A. Withey	Livery			18 00	18 00
L. C. O'Neil	Livery			81 00	81 00
Charles H. Connor	Livery			671 00	671 00
George E. Wright	Livery			66 00	66 00
Mrs. Grace Keating	Livery			331 00	331 00
David Butler	Livery			232 50	232 50
George H. Shufelt	Livery			411 00	411 00
James Murphy	Livery			36 00	36 00

Construction of Barge Canal — Erie Canal — (Concluded).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
The Onondaga	Livery			$43 75	$43 75
H. M. Scoville	Livery			168 00	168 00
Logai & Stewart	Livery			320 00	320 00
George Heagle	Livery			27 50	27 50
			$157,123 14	$10,865 04	$167,988 18
Incidental Expenses.					
Instruments, tools and appliances				$281 38	
Office rent				1,568 00	
Fuel and light				474 14	
Stationery and printing				191 06	
Postage				359 98	
Telephone and telegraph				831 86	
Miscellaneous				7,059 60	
					10,766 02
Total					$178,754 20

Construction of Barge Canal — Oswego Canal.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edwin Styring	Division engineer	$400 per month	$1,350 00	$91 84	$1,441 84
Guy Moulton	First resident engineer	250 per month	900 00	10 00	910 00
James Burden	Resident engineer	250 per month	3,000 00	93 62	3,093 62
Theron M. Ripley	Resident engineer	250 per month	3,000 00	372 53	3,372 53
A. B. Dewey	Confidential stenographer	125 per month	625 00		625 00
W. D. Gartland	Stenographer	100 per month	1,025 00		1,025 00
Chester C. Hahn	Stenographer	75 per month	885 00		885 00
Harvey Wagner	Stenographer	125 per month	375 00		375 00
John D. Scanlon	Cashier	150 per month	300 00		300 00
W. S. Morris	Estimate clerk	150 per month	1,050 00		1,050 00
John Kelley	Chauffeur	100 per month		2 25	2 25
L. C. West	Bridge designer	175 per month	350 00		350 00
J. H. Forth	Tracer	83 33 per month	83 37		83 37
Harry Kehoe	Draftsman	5 00 per day	1,565 00		1,565 00
C. F. Hopstein	Draftsman	5 00 per day	180 00	52 00	232 00
E. M. Weiskotten	Draftsman	5 00 per day	1,300 00		1,300 00
H. M. Cox	Draftsman	4 00 per day	788 00		788 00
H. W. Baker	Draftsman	5 00 per day	957 00		957 00
H. H. Brown	Assistant engineer	6 00 per day	1,968 00		1,968 00
P. H. Budd	Assistant engineer	6 00 per day	1,880 00	296 83	2,176 83
Solomon Reswick	Assistant engineer	6 00 per day	1,898 00	133 70	2,031 70
D. H. Judson	Assistant engineer	5 50 per day	1,732 50		1,732 50
George H. Haley	Assistant engineer	7 00 per day	2,125 00	10 75	2,135 75
F. H. Flint	Assistant engineer	6 00 per day	1,724 00		1,724 00
E. M. Ellis	Assistant engineer	7 00 per day	2,345 00	562 82	2,907 82
I. S. Badger	Assistant engineer	6 00 per day	501 00		501 00
H. A. J. Castor	Assistant engineer	6 00 per day	1,668 00	207 00	1,875 00
M. D. Ewell	Assistant engineer	5 00 per day	1,625 00	16 40	1,641 40
William Carnrike	Assistant engineer	5 00 per day	1,591 00		1,591 00
Karl Moulton	Assistant engineer	5 00 per day	1,544 50		1,544 50
W. H. Hilborn	Leveler	5 00 per day	1,560 00		1,560 00
George C. Hannon	Leveler	5 00 per day	1,655 00		1,655 00
H. B. Armstrong	Leveler	5 00 per day	1,466 50		1,466 50
E. J. Clohessy	Leveler	5 00 per day	1,525 50		1,525 50
John D. Ettinger	Leveler	4 50 per day	1,435 50		1,435 50
C. E. Learned	Leveler	5 00 per day	1,590 00		1,590 00
L. H. Wright	Leveler	4 50 per day	1,458 00		1,458 00
R. M. Mark	Leveler	4 50 per day	1,530 25		1,530 25
A. J. Crowe Jr.	Leveler	4 50 per day	1,302 75		1,302 75

Construction of Barge Canal—Oswego Canal—(Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
F. C. Sellnow	Rodman	$3 50 per day	$798 00	$4 50	$802 50
E. K. Dewey	Rodman	3 50 per day	1,116 00		1,116 00
J. Rosenweig	Rodman	3 50 per day	1,061 00		1,061 00
Philip J. Baron	Rodman	4 00 per day	1,216 50		1,216 50
Vernon Vanderburg	Rodman	3 50 per day	1,194 50		1,194 50
Raymond Traver	Rodman	3 50 per day	462 00		462 00
Roy Engell	Rodman	3 50 per day	1,065 00		1,065 00
A. W. Holmes	Rodman	3 50 per day	400 75		400 75
J. M. Barney	Rodman	3 50 per day	294 00	2 00	296 00
Myron Serby	Rodman	3 50 per day	283 50		283 50
Charles B. Hogan	Rodnam	3 50 per day	266 00		266 00
Ralph Hamilton	Rodman	3 50 per day	245 00		245 00
W. D. Kring	Rodman	3 50 per day	231 00		231 00
G. A. Woodard	Rodman	3 50 per day	265 00		265 00
E. C. Ansley	Rodman	3 50 per day	265 00		265 00
Allen T. Brown	Rodman	3 50 per day	1,048 00		1,048 00
F. J. Beach	Rodman	3 50 per day	816 50		816 50
R. E. Gallavin	Chainman	3 00 per day	72 00		72 00
M. W. Booth	Chainman	3 00 per day	722 00		722 00
William Crahan	Chainman	3 00 per day	1,068 00		1,068 00
R. J. Storm	Chainman	3 00 per day	1,023 00		1,023 00
E. H. Assenheimer	Chainman	3 00 per day	987 00		987 00
G. E. Cahill	Chainman	3 00 per day	854 00		854 00
W. W. Redfern	Chainman	3 00 per day	1,011 00		1,011 00
James B. Sullivan	Chainman	3 00 per day	966 00		966 00
M. J. Kelley	Chainman	3 00 pur day	1,004 50		1,004 50
A. X. Marilley	Chainman	2 50 per day	237 50		237 50
H. W. Fear	Chainman	2 50 per day	240 00		240 00
R. E. Button	Chainman	2 50 per day	165 00		165 00
A. H. Hallenbeck	Inspector	5 00 per day	855 00		855 00
W. J. Kelly	Inspector	5 00 per day	1,755 00		1,755 00
W. N. Dutcher	Inspector	5 00 per day	1,630 00		1,630 00
Charles B. Herring	Inspector	4 00 per day	1,266 50		1,266 50
William Walter	Inspector	5 00 per day	1,660 00		1,660 00
A. V. Markham	Inspector	3 50 per day	119 00		119 00
Clark H. Norton	Laborer	2 00 per day	54 00		54 00
T. R. Ward	Laborer	2 00 per day	730 00		730 00
Dennis Heenan	Laborer	2 00 per day	630 00		630 00
P. L. Ryan	Laborer	2 00 per day	532 00		532 00
Martin Ward	Laborer	2 00 per day	652 00		652 00
William Cronin	Laborer	2 00 per day	662 00		662 00
Claude Althouse	Laborer	2 00 per day	630 00		630 00
Alonzo Clark	Laborer	2 00 per day	642 00		642 00
J. M. Foley	Laborer	2 00 per day	632 00		632 00
William Fitzgibbons, Jr.	Laborer	2 00 per day	632 00		632 00
William Griggs, Jr	Laborer	2 00 per day	628 00		628 00
E. H. Kimball	Laborer	2 00 per day	110 00		110 00
F. J. Lynch	Laborer	2 00 per day	210 00		210 00
E. M. Willis	Laborer	2 00 per day	380 00		380 00
Henry Turk	Laborer	2 00 per day	364 00		364 00
Arthur Gorton	Laborer	2 00 per day	386 00		386 00
James Tyrell	Laborer	2 00 per day	98 00		98 00
George Fitzgibbons	Laborer	2 00 per day	106 00		106 00
Jesse Penfield	Laborer	2 00 per day	634 00		634 00
Daniel Mehegan	Laborer	2 00 per day	112 00		112 00
John Madigan	Laborer	2 00 per day	120 00		120 00
M. E. Murray	Laborer	2 00 per day	630 00		630 00
Thomas Brady	Laborer	2 00 per day	488 00		488 00
William Cavanagh	Laborer	2 00 per day	634 00		634 00
Charles A. Stein, Jr	Laborer	2 00 per day	140 00		140 00
Charles B. Moran	Laborer	2 00 per day	104 00		104 00
A. Moosbrugger	Axeman	2 50 per day	807 50		807 50
Patrick Ryan	Boatman	3 00 per day	942 00		942 00
John Shay	Boatman	3 00 per day	939 00		939 00
Thomas Redmond	Boatman	3 00 per day	939 00		939 00
James McKay	Boatman	3 00 per day	171 00		171 00
James Griffin	Boatman	3 00 per day	945 00		945 00
James Lair	Boatman	3 00 per day	973 50		973 50
Joseph Roth	Boatman	3 00 per day	327 00		327 00
James Tyrell	Boatman	3 00 per day	198 00		198 00
George Archambo	Gage reader	6 00 per month	72 00		72 00
ames J. Frisbie	Gage reader	5 00 per month	60 00		60 00

Construction of Barge Canal — Oswego Canal — (Concluded).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Leon Hallenbeck	Gage reader	$5 00 per month	$60 00	....	$60 00
Bert Thomas	Gage reader	5 00 per month	60 00	....	60 00
D. D. Tompkins	Gage reader	5 00 per month	60 00	....	60 00
D. M. Wilcox	Gage reader	5 00 per month	60 00	....	60 00
M. T. Crimmins	Livery	....	....	$29 00	29 00
Garrett Bros	Livery	....	....	103 50	103 50
Fulton Livery Co	Livery	....	....	523 00	523 00
Harry McFarland	Livery	....	....	28 00	28 00
			$96,076 12	$2,539 74	$98,615 86
Incidental Expenses.					
Instruments, tools and appliances				$88 16	
Office rent				1,351 98	
Fuel and light				269 20	
Stationery and printing				65 77	
Postage				175 29	
Telephone and telegraph				506 46	
Miscellaneous				3,882 53	
					6,339 39
Total					$104,955 25

Construction of Barge Canal — Cayuga and Seneca Canal.

Chapter 339, Laws of 1911; Chapter 214, Laws of 1911; Chapter 391, Laws of 1909.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edwin Styring	Division engineer	$400 per month	$1,450 00	$72 18	$1,522 18
G. F. Stickney	Supervising engineer	5,000 per year	1,666 68	13 85	1,680 53
W. H. Yates	Supervising engineer	400 per month	1,523 53	....	1,523 53
Guy Moulton	First resident engineer	250 per month	200 00	6 25	206 25
G. S. Greene, Jr	Consulting engineer	60 00 per day	60 00	15 90	75 90
T. Kennard Thomson	Consulting engineer	60 00 per day	60 00	15 75	75 75
W. H. Burr	Consulting engineer	60 00 per day	60 00	12 85	72 85
M. G. Barnes	Consulting engineer	60 00 per day	60 00	12 65	72 65
L. S. Hulburd	Resident engineer	250 per month	2,991 94	186 70	3,178 64
A. E. Steere	Resident engineer	250 per month	3,000 00	216 99	3,216 99
Horace Corbin	Bridge designer	150 per month	150 00	....	150 00
F. A. Hermans	Bridge designer	150 per month	150 00	....	150 00
L. C. West	Bridge designer	150 per month	198 39	....	198 39
W. S. McDowell	Bridge designer	150 per month	254 84	....	254 84
J. L. Bradford	Bridge designer	150 per month	70 00	....	70 00
H. Auerback	Bridge designer	150 per month	56 45	....	56 45
P. J. Peters	Bridge designer	150 per month	123 39	....	123 39
J. M. Angus	Bridge draftsman	125 per month	40 32	....	40 32
C. E. Quimby	Bridge draftsman	125 per month	40 32	....	40 32
C. F. Hopstein	Draftsman	5 00 per day	130 00	50 74	180 74
Charles Messina	Bridge draftsman	5 00 per day	229 00	....	229 00
A. E. Green	Draftsman	5 00 per day	157 26	....	157 26
C. M. Chuckrow	Draftsman	4 00 per day	108 00	....	108 00
J. H. McCormick, Jr	Draftsman	5 00 per day	135 00	....	135 00
J. H. Stevens	Draftsman	5 00 per day	135 00	....	135 00
S. T. Vosburgh	Draftsman	5 00 per day	135 00	....	135 00
L. B. Westfall	Draftsman	5 00 per day	135 00	....	135 00
C. A. Huhne	Draftsman	5 00 per day	183 00	....	183 00
J. J. Cosgrave	Draftsman	5 00 per day	150 00	....	150 00
W. J. Bell	Tracer	60 00 per month	720 00	....	720 00
R. Ruderman	Tracer	60 00 per month	90 00	....	90 00
C. S. Cooper	Tracer	60 00 per month	60 00	....	60 00
C. J. Hall	Tracer	60 00 per month	60 00	....	60 00
H. Forth	Tracer	83 33 per month	83 33	....	83 33

Construction of Barge Canal — Cayuga and Seneca Canal — (Continued).

Chapter 339, Laws of 1911; Chapter 214, Laws of 1911; Chapter 391, Laws of 1909.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
W. J. Henk	Tracer	$83 33 per month	$83 33	....	$83 33
P. R. Murray	Tracer	83 33 per month	83 33	....	83 33
John D. Scanlon	Cashier	150 per month	300 00	....	300 00
W. S. Morris	Estimate clerk	150 per month	300 00	....	300 00
A. B. Dewey	Confidential stenographer	125 per month	185 48	....	185 48
J. H. Meagher	Confidential stenographer	125 per month	87 50	....	87 50
Harvey Wagner	Stenographer	125 per month	375 00	....	375 00
John Kelley	Chauffeur	100 per month	....	$2 85	2 85
R. W. Cady	Assistant engineer	7 00 per day	1,950 00	47 05	1,997 05
B. I. Hall	Assistant engineer	6 00 per day	1,928 00	24 20	1,952 20
L. L. Hadley	Assistant engineer	6 00 per day	2,047 00	43 72	2,090 72
Thomas R. Tetley, Jr.	Assistant engineer	7 00 per day	2,119 00	35 30	2,154 30
H. C. Smith	Assistant engineer	7 00 per day	1,213 00	19 36	1,232 36
S. Cohen	Assistant engineer	5 00 per day	200 00	....	200 00
H. A. Gehring	Assistant engineer	6 00 per day	786 00	62 55	848 55
E. S. Overbaugh	Assistant engineer	6 00 per day	1,709 50	91 83	1,801 33
I. S. Badger	Assistant engineer	6 00 per day	162 00	2 15	164 15
G. E. Gibson	Assistant engineer	7 00 per day	2,191 00	....	2,191 00
R. N. Barrett	Assistant engineer	5 00 per day	95 00	....	95 00
H. W. Benedict	Assistant engineer	6 00 per day	162 00	....	162 00
M. W. Grimes	Assistant engineer	6 00 per day	240 00	....	240 00
C. L. Hayward	Assistant engineer	6 00 per day	240 00	....	240 00
T. R. Hazelum	Assistant engineer	5 00 per day	135 00	....	135 00
I. S. Matlaw	Assistant engineer	7 00 per day	189 00	....	189 00
H. S. Sparr	Assistant engineer	6 00 per day	278 00	....	278 00
H. A. Weeks	Assistant engineer	7 00 per day	280 00	....	280 00
J. B. Whipple	Assistant engineer	6 00 per day	114 00	....	114 00
S. R. Tighe	Assistant engineer	5 00 per day	95 00	....	95 00
D. B. Sayer	Assistant engineer	6 00 per day	153 00	....	153 00
J. M. Prior	Leveler	5 00 per day	345 00	....	345 00
R. E. Drake	Leveler	5 00 per day	1,570 00	....	1,570 00
M. L. Babcock	Leveler	4 50 per day	1,406 50	....	1,406 50
C. H. Adams	Leveler	4 50 per day	247 50	....	247 50
H. L. Drake	Leveler	4 50 per day	328 50	....	328 50
H. E. Hayes	Leveler	4 50 per day	117 00	....	117 00
F. E. Hardy	Rodman	4 00 per day	1,116 50	40 00	1,156 50
J. George Dobie	Rodman	3 50 per day	52 50	2 69	55 19
M. J. Chryst	Rodman	4 00 per day	104 00	4 06	103 06
L. E. Moyer	Rodman	4 00 per day	1,230 50	....	1,230 50
H. L. Drake	Rodman	4 00 per day	940 50	....	940 50
Morris Strauss	Rodman	3 50 per day	924 00	....	924 00
D. A. McClellan	Rodman	4 00 per day	1,091 00	....	1,091 00
M. A. Darville	Rodman	3 50 per day	367 50	....	367 50
J. R. Tighe	Rodman	4 00 per day	636 00	....	636 00
G. C. Baker	Rodman	3 50 per day	539 00	....	539 00
R. W. Austin	Rodman	3 50 per day	108 50	....	108 50
J. H. Williams	Rodman	3 50 per day	217 00	....	217 00
Frank Layburn	Chainman	3 00 per day	999 00	....	999 00
K. K. Schulte	Chainman	2 50 per day	667 50	....	667 50
Harry Goldman	Chainman	2 50 per day	315 00	....	315 00
S. W. Mosher	Chainman	2 50 per day	152 50	....	152 50
H. G. Lehrback	Chainman	2 50 per day	132 50	....	132 50
G. W. Scott	Chainman	2 50 per day	50 00	....	50 00
A. V. Marham	Inspector	3 50 per day	164 50	....	164 50
E. F. Allen	Laborer	2 00 per day	626 00	....	626 00
F. P. Ryan	Laborer	2 00 per day	650 00	....	650 00
James Thorne	Laborer	2 00 per day	644 00	....	644 00
Peter Mc Kevitt	Laborer	2 00 per day	214 00	....	214 00
George J. Farrell	Laborer	2 00 per day	574 00	....	574 00
Francis Cleary	Laborer	2 00 per day	528 00	....	528 00
J. D. Marshall	Laborer	2 00 per day	626 00	....	626 00
J. W. Marshall	Laborer	2 00 per day	612 00	....	612 00
Benjamin Rogers	Laborer	2 00 per day	106 00	....	106 00
James Adkinson	Laborer	2 00 per day	606 00	....	606 00
C. W. Edwards	Laborer	2 00 per day	76 00	....	76 00
J. J. Maloney	Laborer	2 00 per day	394 00	....	394 00
John Tubridy	Laborer	2 00 per day	392 00	....	392 00
John Costigan	Laborer	2 00 per day	648 00	....	648 00
Seaman Knapp	Laborer	2 00 per day	354 00	....	354 00
R. A. Petrone	Laborer	2 00 per day	124 00	....	124 00

Construction of Barge Canal — Cayuga and Seneca Canal — (Concluded).

Chapter 339, Laws of 1911; Chapter 214, Laws of 1911; Chapter 391, Laws of 1909.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
F. T. Whalen	Laborer	$2 00 per day	$132 00	....	$132 00
C. E. Skinner	Laborer	2 00 per day	124 00	....	124 00
J. F. Sullivan	Laborer	2 00 per day	132 00	....	132 00
George B. Kelley	Laborer	2 00 per day	2 00	....	2 00
W. E. Lerch	Laborer	2 00 per day	266 00	....	266 00
Walter Conley	Laborer	2 00 per day	274 00	....	274 00
John Clary	Laborer	2 00 per day	24 00	....	24 00
John Walsh	Laborer	2 00 per day	22 00	....	22 00
Dean Davis	Boatman	3 00 per day	942 00	....	942 00
J. H. McCabe	Boatman	3 00 per day	978 00	....	978 00
John McGraine	Boatman	3 00 per day	948 00	....	948 00
Thomas F. Redmond	Boatman	3 00 per day	162 00	....	162 00
W. H. Rundle	Boatman	3 00 per day	936 00	....	936 00
Charles Hassan	Boatman	3 00 per day	811 00	....	811 00
James L. Grogan	Boatman	3 00 per day	159 00	....	159 00
E. B. Schoot	Boatman	3 00 per day	354 00	....	354 00
George W. Waters	Boatman	3 00 per day	375 00	....	375 00
E. A. Sullivan	Boatman	3 00 per day	90 00	....	90 00
Seymour Addis	Gage reader	10 per month	120 00	....	120 00
Edward Fitzgerald	Gage reader	7 per month	84 00	....	84 00
A. H. O'Rielly	Gage reader	7 per month	84 00	....	84 00
John Quail	Gage reader	5 per month	60 00	....	60 00
D. M. Kellogg	Livery	....	....	$142 00	142 00
			$60,443 09	$1,121 62	$61,564 71
Incidental Expenses.					
Instruments, tools and appliances				$115 54	
Office rent				497 40	
Fuel and light				61 92	
Stationery and printing				211 08	
Postage				58 60	
Telephone and telegraph				187 88	
Miscellaneous				1,318 68	2,451 10
Total					$64,015 81

Dominick Street Bridge, Rome.

Chapter 877, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy Moulton	First resident engineer	$250 per month	$50 00	$2 41	$52 41
Carl L. Bannister	Assistant engineer	6 00 per day	570 00	6 48	576 48
A. W. Smith	Assistant engineer	6 00 per day	502 00	10 30	512 30
J. B. McGuire	Assistant engineer	6 00 per day	66 00	....	66 00
E. T. Gawkins	Rodman	3 50 per day	92 50	....	92 50
			$1,280 50	$19 19	$1,299 69
Incidental Expenses.					
Postage				$1 82	
Miscellaneous				117 85	119 67
Total					$1,419 36

Improvement of Weigh-Lock Building, Syracuse.

Chapter 524, Laws of 1910.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
C. F. Hopstein	Draftsman	$5 00 per day	$60 00	....	$60 00

Repairs to Willard Dock.

Chapter 728, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
L. S. Hulburd	Resident engineer	$200 per month	$8 06	$2 30	$10 36
L. E. Moyer	Rodman	4 00 per day	16 00	1 85	17 85
Total					$28 21

Main Street Bridge, Boonville.

Chapter 53, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
I. S. Matlaw	Assistant engineer	$7 00 per day	$175 00	....	$175 00
D. B. Sayer	Assistant engineer	5 00 per day	55 00	....	55 00
J. M. Prior	Leveler	5 00 per day	55 00	....	55 00
C. M. Chuckrow	Leveler	4 50 per day	54 00	....	54 00
H. Corbin	Bridge designer	150 per month	87 09	....	87 09
F. A. Hermans	Bridge designer	150 per month	128 23	....	128 23
Charles Messina	Draftsman	4 00 per day	100 00	....	100 00
Total			$654 32	....	$654 32

Lyons Falls Bridge, Lyons Falls.

Chapter 510, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
I. S. Abrahams	Bridge designer	$150 per month	$205 64		$205 64
P. J. Peters	Bridge designer	150 per month	147 58		147 58
J. L. Bradford	Bridge designer	150 per month	84 68		84 68
W. S. McDowell	Bridge designer	150 per month	72 58		72 58
F. A. Hermans	Bridge designer	150 per month	75 00		75 00
L. C. West	Bridge designer	150 per month	147 58		147 58
D. B. Sayer	Assistant engineer	6 00 per day	128 00		128 00
S. Cohen*	Assistant engineer	5 00 per day	135 00		135 00
R. K. Sheldon	Assistant engineer	6 00 per day	24 00	$43 20	67 20
C. M. Chuckrow	Leveler	4 50 per day	13 50		13 50
J. M. Prior	Leveler	5 00 per day	70 00		70 00
F. C. Curtin	Leveler	4 50 per day	18 00		18 00
R. W. Austin	Rodman	4 00 per day	84 00		84 00
J. S. Bierhardt	Rodman	4 00 per day	16 00		16 00
A. E. Green	Draftsman	5 00 per day	98 39		98 39
Charles Messina	Draftsman	4 00 per day	52 00		52 00
C. A. Huhne	Draftsman	4 00 per day	56 00		56 00
J. F. Blaise	Draftsman	125 per month	60 48		60 48
C. S. Cooper	Tracer	60 per month	29 03		29 03
R. Ruderman	Tracer	60 per month	29 03		29 03
C. E. Van Brocklin	Laborer	2 00 per day	8 00		8 00
			$1,554 49	$43 20	$1,597 69
	Incidental Expenses.				
Miscellaneous					7 89
Total					$1,605 58

Repairs to Owasco Outlet.

Chapter 654, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy Moulton	First resident engineer	$250 per month		$1 55	$1 55
R. K. Sheldon	Assistant engineer	6 00 per day	$30 00		30 00
F. C. Curtin	Leveler	4 50 per day	126 00	76 19	202 19
J. S. Bierhardt	Rodman	4 00 per day	112 00		112 00
J. M. Barney	Rodman	3 50 per day	17 50		17 50
C. E. Van Brocklin	Laborer	2 00 per day	54 00		54 00
George B. Kelley	Laborer	2 00 per day	10 00		10 00
			$349 50	$77 74	$427 24
	Incidental Expenses.				
Miscellaneous					5 40
Total					$432 64

Surveys for State Board of Claims.

Chapter 811, Laws of 1911; Chapter 547, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy Moulton	First resident engineer	$250 per month	$50 00	....	$50 00
D. E. Whitford	Assistant engineer	6 00 per day	1,722 00	....	1,722 00
R. K. Sheldon	Assistant engineer	6 00 per day	174 00	$34 27	208 27
I. S. Badger	Assistant engineer	5 00 per day	25 00	....	25 00
C. F. Hopstein	Draftsman	5 00 per day	35 00	7 08	42 08
F. C. Curtin	Leveler	4 50 per day	111 00	....	111 00
M. J. Chryst	Rodman	4 00 per day	8 00	....	8 00
J. S. Bierhardt	Rodman	4 00 per day	76 00	....	76 00
E. T. Gawkins	Rodman	3 50 per day	80 50	....	80 50
C. E. Van Brocklin	Laborer	2 00 per day	36 00	....	36 00
			$2,317 50	$41 35	$2,358 85
	Incidental Expenses.				
Miscellaneous					1 40
Total					$2,360 25

Black River Survey.

Chapter 190, Laws of 1911; Chapter 703, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Louis A. Burns	Resident engineer	$250 per month	....	$3 30	$3 30
C. G. Lamphere	Draftsman	5 00 per day	$45 00	....	45 00
Newell H. Heath	Gage reader	10 00 per month	120 00	....	120 00
Ona Marshall	Gage reader	10 00 per month	120 00	....	120 00
B. F. Wise	Gage reader	10 00 per month	120 00	....	120 00
			$405 00	$3 30	$408 30
	Incidental Expenses.				
Miscellaneous					2 00
Total					$410 30

Chemung Canal Survey.

Chapter 220, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Louis A. Burns	Resident engineer	$250 per month	$1,250 00	$359 93	$1,609 93
Carl L. Bannister	Assistant engineer	6 00 per day	732 00		732 00
C. W. Deane	Leveler	4 50 per day	549 00		549 00
A. D. Merrill	Leveler	4 50 per day	414 00		414 00
Charles E. Hoehn	Rodman	3 50 per day	322 00		322 00
F. T. Whalen	Laborer	2 00 per day	230 00		230 00
John Sullivan	Laborer	2 00 per day	234 00		234 00
R. A. Patrone	Laborer	2 00 per day	70 00		70 00
			$3,801 00	$359 93	$4,160 93
Incidental Expenses.					
Stationery and printing				$11 93	
Livery				12 50	
Fuel and light				25	
Postage				3 25	
Office rent				54 00	
Telephone and telegraph				13 70	
Miscellaneous				195 55	
					291 18
Tota					$4,452 11

Surveys, Field Notes and Manuscript Maps.

Chapter 511, Laws of 1912; Chapter 290, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
E. C. Olcott	Assistant engineer	$7 00 per day	$976 00	$43 66	$1,019 66
A. A. Vickers	Chainman	3 00 per day	375 00		375 00
John N. Olcott	Chainman	2 50 per day	370 00		370 00
William Biehler	Boatman	3 00 per day	393 00	6 10	399 10
F. W. Kinney	Boatman	3 00 per day	27 00		27 00
George Millert	Laborer	2 00 per day	20 00		20 00
Clayton Plummer	Laborer	2 00 per day	20 00		20 00
Earl W. Willis	Laborer	2 00 per day	46 00		46 00
			$2,227 00	$49 76	$2,276 76
Incidental Expenses.					
Postage				$0 17	
Miscellaneous				112 69	
					112 86
Total					$2,389 62

SUMMARY.

The foregoing tables are summarized as follows:

Ordinary Repairs to Canals.

1.	Erie canal, chapter 546, Laws of 1912	$8,710 83
2.	Black River canal, chapter 546, Laws of 1912	289 17

Construction of Barge Canal.

3.	Erie canal, chapter 147, Laws of 1903, and amendatory laws	178,754 20
4.	Oswego canal, chapter 147, Laws of 1903, and amendatory laws	104,955 25
5.	Cayuga and Seneca canal, chapter 391, Laws of 1909, and amendatory laws	64,015 81

Special Work.

6.	Dominick street bridge, Rome, chapter 877, Laws of 1912	1,419 36
7.	Improvement of Weigh-lock building, Syracuse, chapter 524, Laws of 1910	60 00
8.	Repairs to Willard dock, chapter 728, Laws of 1913	28 21
9.	Main street bridge, Boonville, chapter 53, Laws of 1912	654 32
10.	Lyons Falls bridge, Lyons Falls, chapter 510, Laws of 1912	1,605 58
11.	Repairs to Owasco outlet, chapter 654, Laws of 1913	432 64

Special Surveys.

12.	Surveys for State Board of Claims, chapter 811, Laws of 1911; chapter 547, Laws of 1912	2,360 25
13.	Black river survey, chapter 190, Laws of 1911; chapter 703, Laws of 1913	410 30
14.	Chemung canal survey, chapter 220, Laws of 1913	4,452 11
15.	Surveys, field notes and manuscript maps, chapter 511, Laws of 1912; chapter 290, Laws of 1913	2,389 62
	Total	$370,537 65

TABLE OF CONTRACTS COMPLETED ON THE MIDDLE DIVISION DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1913.

Special Work.

CONTRACTOR.	Date of contract.	Character of work.	ACT.		Engineer's preliminary estimate.	Contract price.	Final payment.
			Chap.	Year.			
Bornhorst & Miller	Dec. 23. 1912	Mathews avenue bridge, Solvay	47	1912	$5,295 00	$4,264 00	$4,266 08

Construction of the Barge Canal.

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
James Stewart & Co	Jan. 20, 1912	Contract No. 5-A, Erie canal — Completing contract No. 5 from Mosquito Point to Campbell's bridge	$395,285 00	$326,902 30	$319,350 83
Penn Bridge Co	Nov. 7, 1908	Contract No. 13, Erie canal — Bridges on part of contract No. 12	17,471 50	14,159 00	13,490 63
The Kinser Construction Co	Nov. 23, 1908	Contract No. 46, Erie canal — Fox Ridge to Wayne county line	1,367,583 00	842,720 92	842,688 52
Arthur McMullen	Oct. 19, 1908	Contract No. 55, Water-supply — Delta reservoir	1,014,525 00	945,839 55	882,772 86
Lupfer & Remick	Aug. 5, 1911	Contract No. 85, Oswego canal — Bridge over lock at Phoenix	12,783 50	13,150 50	12,097 81
D'Olier Engineering Co	April 12, 1910	Contract No. 90, Erie and Oswego canals — Power-supply, Erie canal lock No. 24, and operating equipment, Oswego canal locks Nos. 1, 2, 7 and 8	86,536 35	88,006 41	82,759 15

TABLE OF CONTRACTS PENDING ON THE MIDDLE DIVISION, SEPTEMBER 30, 1913.

Special Work.

CONTRACTOR.	Date of contract.	Character of work.	ACT.		Engineer's preliminary estimate.	Contract price, as affected by alterations.	Payment to September 30, 1913.
			Chap.	Year.			
Lupfer & Remick	July 24, 1912	Constructing a highway bridge over Black River canal at East Dominick street, Rome	877	1911	$22,790 50	$19,874 00	$16,821 00
Joseph H. Conners	Aug. 27, 1913	Repairs to dike south of Fulton	515	1913	10,012 00	10,995 00	7,353 00

Construction of the Barge Canal.

Chapter 147, Laws of 1903; Chapter 391, Laws of 1909; and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1913.
The T. A. Gillespie Co.	Dec. 14, 1911	Contract No. 10-A, Oswego canal — From Broadway bridge, Fulton, south to contract No. 39	$103,058 00	$174,513 90	$158,800 00
Oswego Construction Co., Inc.	Mar. 4, 1912	Contract No. 10-B, Oswego canal — From the upper end of lock No. 2, Fulton, north to contract No. 37	515,044 00	516,336 05	465,620 00
James Stewart & Co.	Sept. 23, 1907	Contract No. 12, Erie canal — Oneida lake to Mosquito Point	3,082,560 00	3,563,331 49	2,833,570 00
M. Fitsgerald	Sept. 24, 1910	Contract No. 22, Erie canal — Bridges on part of contract No. 12	107,126 00	127,936 80	78,800 00
Lupfer & Remick	Aug. 8, 1912	Contract No. 22-A, Erie canal — Bridge at Weedsport	24,916 00	27,099 20	21,630 00
Gilmour-Horton-Allen Co.	Sept. 16, 1907	Contract No. 35, Oswego canal — Through Oswego	752,760 00	723,632 14	668,060 00
Henry P. Burgard	Dec. 9, 1910	Contract No. 37, Oswego canal — Between Fulton and Oswego	1,992,220 00	2,500,118 76	1,836,860 00
Salladin & Henrick	Nov. 29, 1912	Contract No. 37-R, Oswego canal — Moving cemetery from site cf contract No. 37	5,333 30	4,890 80	3,660 00

James Stewart & Co	April 15, 1910	Contract No. 39, Oswego canal — Three River Point to Fulton	972,900 00	1,047,786 30	390,120 00
Grant Smith & Co. & Locker	Feb. 24, 1913	Contract No. 42-A, Erie canal — Herkimer-Oneida county line to Oriskany road	1,033,037 85	1,014,671 83	200,480 00
The M. A. Talbott Co	Oct. 15, 1909	Contract No. 43, Erie canal — Oriskany road to Mud creek	1,529,885 00	1,448,985 05	597,200 00
Scott Brothers	Jan. 8, 1910	Contract No. 44, Erie canal — Mud creek to contract No. 4	1,926,093 00	1,730,867 35	1,157,990 00
Buffalo Dredging Co	Sept. 23, 1910	Contract No. 50, Water-supply — Dam across West Canada creek at Hinckley	1,076,000 00	971,768 52	530,580 00
The Alto Construction Co	Dec. 23, 1910	Contract No. 51, Water-supply — Feeder from Trenton Falls on West Canada creek to Nine-Mile creek	424,710 00	400,227 33	231,690 00
New York State Dredging Co	Aug. 6, 1912	Contract No. 57, Erie canal — Through Onondaga lake outlet	85,625 00	93,596 00	61,120 00
Lupfer & Remick	Aug. 8, 1912	Contract No. 90-A, Oswego canal — Power-plants at locks Nos. 1, 2, 7 and 8	64,840 00	64,020 20	22,440 00
MacArthur Bros. Co. & Lord Electric Co	Aug. 12, 1913	Contract No. 93, Erie and Oswego canals — Power-plants at Erie canal locks Nos. 20, 21, 22, 23 and 25 and New London junction lock, and Oswego canal locks Nos. 3, 5 and 6	393,701 00	379,693 50	400 00
W. J. Burns Co	Sept. 12, 1913	Contract No. 100, Erie and Oswego canals — Bridges over Erie canal at Long Branch and Belgium and over Oswego canal at Hinmansville	181,923 00	179,061 00	0
Barrally & Ingersoll	Aug. 8, 1912	Contract No. 101, Erie canal — Bridge at Three Rivers	44,599 50	40,983 50	23,730 00
Lupfer & Remick	Feb. 20, 1913	Contract No. 102, Erie canal — Bridge at Howland island	25,035 00	25,993 00	0
Barrally & Ingersoll	Dec. 10, 1912	Contract No. 103, Oswego canal — Bridge at Phoenix	185,655 00	197,995 00	20,610 00
R. B. Murdock	Mar. 5, 1912	Contract No. 104, Oswego canal — Bridge at Broadway, Fulton	45,580 00	39,370 00	34,190 00
Scott Brothers	Dec. 30, 1910	Contract A, Cayuga and Seneca canal — Lock No. 1 and dam No. 1, near Cayuga	393,133 50	376,233 50	300,520 00
Crowell-Sherman-Stalter Co	Dec. 29, 1910	Contract B, Cayuga and Seneca canal — Dredging Seneca river, Montezuma to Cayuga lake, Cayuga lake to Seneca Falls, Waterloo to Seneca lake	1,832,550 00	1,435,484 50	906,480 00
Larkin & Sangster	Jan. 11, 1913	Contract C, Cayuga and Seneca canal — Locks, dam, etc., at Seneca Falls	1,140,872 50	1,189,246 50	241,980 00
Cleveland & Sons Co	Jan. 7, 1913	Contract E, Cayuga and Seneca canal — Lock, dam, etc., at Waterloo	319,666 50	347,216 50	23,950 00
James H. Dawes	Dec. 22, 1911	Contract H, Cayuga and Seneca canal — Dredging Cayuga lake inlet	178,237 00	216,509 90	206,560 00
The Central Dredging Co	Sept. 23, 1912	Contract I, Cayuga and Seneca canal — Seneca lake to Montour Falls	304,330 00	215,639 00	135,820 00

TABLE OF CONTRACTS PENDING ON THE MIDDLE DIVISION, SEPTEMBER 30, 1913 — (*Concluded*).

Special Work Connected with Barge Canal Construction.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price.	Value of work done to September 30, 1913.
Henry P. Burgard	Jan. 3, 1912	Road A, adjacent to contract No. 37	$4,629 00	$4,629 00	$1,810 00
Henry P. Burgard	Jan. 3, 1912	Road B, adjacent to contract No. 37	93,019 50	93,019 50	81,830 00
James Stewart & Co	Aug. 14, 1912	Ox creek highways, near Fulton	73,353 50	73,353 50	62,150 00
Buffalo Dredging Co	July 11, 1913	Highways adjacent to contract No. 50	41,927 00	41,927 00	34,090 00

EXTRA AND UNSPECIFIED WORK ORDERS PAID TO SEPTEMBER 30, 1913.

CONTRACT NO.	Date of order.	Amount.	Total.
4	Nov. 2, 1906	$1,257 29	
4	May 20, 1909	281 34	
4	June 4, 1909	399 22	
4	Aug. 30, 1909	7,635 64	
4	Nov. 18, 1909	62 65	
4	May 24, 1910	2,948 31	$12,584 45
7	June 9, 1908	$49 50	
7	Feb. 2, 1909	24 18	
7	May 10, 1909	3,143 17	3,216 85
10	Oct. 21, 1907	$166 00	
10	Jan. 13, 1908	1,032 00	
10	April 24, 1908	....	
10	Feb. 1, 1911	821 10	2,019 10
10-A	July 2, 1912	$35 00	
10-A	July 10, 1912	1,709 64	1,744 64
10-B	Dec. 10, 1912	$4,500 00	
10-B	June 20, 1913	365 00	4,865 00
12	Jan. 25, 1909	$328 51	328 51
22	Dec. 13, 1911	$12,446 79	
22	Sept. 28, 1912	2,310 30	14,757 09
33	July 14, 1911	$302 16	302 16
35	Oct. 2, 1908	$760 95	
35	Sept. 20, 1910	150 00	
35	Aug. 4, 1913	2,463 36	3,374 31
37-R	May 23, 1913	$23 00	23 00
43	Feb. 27, 1913	$4,914 00	4,914 00
44	May 27, 1913	$135 55	
44	July 14, 1913	710 00	843 55
45	Dec. 15, 1908	$68 71	
45	Aug. 5, 1909	480 20	
45	Oct. 29, 1909	317 97	866 88
50	Sept. 22, 1911	$1,270 20	1,270 20
51	Aug. 9, 1912	$816 00	
51	Nov. 12, 1912	126 00	942 00
53	April 18, 1911	$236 38	
53	May 3, 1911	876 76	1,113 14
55	Dec. 29, 1910	$405 30	
55	Jan. 12, 1912	706 12	
55	May 20, 1912	362 69	
55	July 29, 1912	130 20	
55	July 30, 1912	58 65	
55	Aug. 28, 1912	374 57	2,037 53
55-R	July 10, 1912	$101 28	101 28
78	Sept. 3, 1910	$51 10	51 10
79	Jan. 24, 1912	$680 68	680 68
80	Dec. 6, 1911	$209 15	
80	Oct. 1, 1912	939 27	1,148 42
85	Nov. 20, 1911	$50 50	
85	Feb. 28, 1913	190 23	240 73

EXTRA AND UNSPECIFIED WORK ORDERS PAID TO SEPTEMBER 30 1913 — (*Concluded*).

CONTRACT NO.	Date of order.	Amount.	Total.
90	June 15, 1911	$562 42	
90	July 14, 1911	411 99	
90	Jan. 27, 1912	22 00	
90	July 25, 1912	405 00	
90	Sept. 12, 1912	2,548 00	
90	Dec. 19, 1912	16 31	
			$3,965 72
101	Feb. 28, 1913	$941 33	
			941 33
			$62,331 67
CAYUGA AND SENECA CANAL.			
A	May 10, 1913	$160 00	
A	June 12, 1913	1,605 50	
			$1,765 50
I	Mar. 4, 1913	$300 00	
			300 00
			$2,065 50
Grand total	....	....	$64,397 17

REPORT

OF THE

DIVISION ENGINEER

OF THE

WESTERN DIVISION

For the Fiscal Year Ended September 30, 1913

WESTERN DIVISION.

STATE OF NEW YORK,

DEPARTMENT OF STATE ENGINEER AND SURVEYOR,

WESTERN DIVISION.

ROCHESTER, N. Y., *October* 1, 1913.

HON. JOHN A. BENSEL, *State Engineer and Surveyor, Albany, N. Y.:*

SIR.— I have the honor of submitting herewith my report as Division Engineer of the Western Division, for the fiscal year ended September 30, 1913.

The Western Division comprises the existing and proposed lines of all of the Erie canal lying west of the Wayne-Seneca county line and includes other work of the department within the western counties.

The principal work of the division has been the construction of the Barge canal, but there have been in addition several special appropriations under which, at intervals during the year, a considerable corps of assistants has been employed. A description of the work of the division, classified according to the several features into which it naturally falls, is given herewith.

In addition to the staff of engineers assigned to the four residences, W. G. Wildes, Resident Engineer, has been my principal assistant, F. J. Wilbur, Assistant Engineer, has had special charge of the final estimates and division office work, and T. W. Holcomb, Electrical Engineer, has been, since May, 1913, in charge of the electrical work in the division, in coöperation with the several resident engineers.

RIVER IMPROVEMENT PROJECTS.

REPAIRS TO OAK ORCHARD CREEK FEEDER.

(Chapter 547, Laws of 1912.)

Contractor, Barrally & Ingersoll, Rochester, N. Y.

Date of award, November 12, 1912.

Amount of appropriation	$23,500 00
Engineer's original estimate	10,255 00
Supplementary agreement, estimate	10,800 00
Work done to date	1,725 00

This work involves the repair of the diverting dam and head gates in Tonawanda creek, at the entrance to the Oak Orchard creek feeder; also the widening and deepening of about 5.1 miles of feeder, including a portion of Oak Orchard creek where the feeder enters the creek. After the contract was let, but before work actually started, the fact was disclosed that the commission for the drainage of the Tonawanda creek and Oak Orchard creek swamps was preparing to deepen, at its own expense, the rock cut at the lower end of the feeder as an outlet to its drainage project. It was therefore deemed feasible to deepen, at small expense and with material advantage to the community, the upper portion of the feeder more than originally contemplated and a supplementary agreement was entered into with the contractor in September, 1913, having this object in view. As the feeder will not serve the Barge canal, the proposed work is wholly a matter of drainage improvement.

A small dipper dredge, equipped with a ½-cubic yard bucket, is in use on this work.

BERGHOLTZ CREEK IMPROVEMENT.

(Chapter 729, Laws of 1913.)

Amount of appropriation, $10,000.00.

Surveys have been made and plans for this work prepared, which were approved by the Canal Board on September 9, 1913. It involves the deepening and widening of about 1.3 miles of the lower portion of this stream, in the town of Niagara, to connect with an improvement made several years ago, of the upper waters and to prevent particularly the flooding of the Buffalo and Niagara Falls boulevard, which parallels the creek for some distance.

CHEMUNG RIVER IMPROVEMENT.

(Chapter 732, Laws of 1913.)

Amount of appropriation, $25,000.00.

Surveys have been made and plans prepared for excavating a channel about one-half mile long through an island in the Chemung river at Corning, so as to deflect the current from the existing dikes and prevent erosion of same.

ELLICOTT CREEK IMPROVEMENT.

(Chapter 824, Laws of 1913.)

Amount of appropriation, $80,000.00.

Surveys and plans have been nearly completed for deepening, in so far as is possible under this appropriation, the channel of Ellicott creek, within the city of Tonawanda, to the bottom grade of the Barge canal into which it flows.

CANISTEO RIVER IMPROVEMENT.

(Chapter 750, Laws of 1913.)

Amount of appropriation, $50,000.00.

Surveys have been completed and the preparation of plans and estimates is in progress for straightening, widening, diking and protecting the banks of the Canisteo river at Hornell and vicinity, to avoid flooding of adjoining lands.

CHAUTAUQUA OUTLET IMPROVEMENT.

(Chapter 758, Laws of 1913.)

Amount of appropriation, $100,000.00.

Surveys have been completed and preparation of plans and estimates is in progress for straightening, widening and deepening the channel of the Chautauqua lake outlet, otherwise known as the Chadakoin river, at Jamestown, to relieve flood conditions and inundation of adjoining properties at times of flood flow.

BLUE LINE SURVEY.

(Chapter 511, Laws of 1912; Chapter 290, Laws of 1913.)

The work of surveying, mapping and monumenting the right-of-way line, or " blue line," of the existing Erie canal through sections to be abandoned was discontinued in Monroe and Wayne counties during October, 1912, as funds were exhausted. Under the appropriation of 1913, this work was resumed and two parties under L. G. Fisher, Assistant Engineer, have been engaged since June 1, 1913, within the limits of the city of Rochester. A party was started during August, 1913, and has been continued since that date in surveying the blue line between Tonawanda and Buffalo. While very much of the field work will have been completed before the fund available becomes exhausted, it is deemed impossible to finish ths work entirely and a further appropriation is urgently recommended.

BOARD OF CLAIMS.

(Chapter 811, Laws of 1911.)

Numerous surveys have been made, maps prepared and testimony furnished for the Board of Claims in connection with the many cases brought before that Board of alleged damage on account of canal construction.

BARGE CANAL.

(Chapter 147, Laws of 1903, and amendments.)

Contracts amounting to about $28,000,000 have been let in the division. About $23,400,000 worth of work has been done to date, with an engineering expenditure thus far in the local office of 6.3 per cent of this amount.

The Barge canal work in this division has been handled through four residency offices.

RESIDENCY No. 8 covers Wayne county. B. E. Failing, Resident Engineer, is in charge, with office at Lyons.

RESIDENCY No. 9 covers Monroe county. H. J. Knoppel, Supervising Engineer, is in charge, with office at Rochester.

RESIDENCY No. 10-A covers Orleans county. J. V. Hogan, Resident Engineer, is in charge, with office at Medina.

RESIDENCIES Nos. 10-B and 11 cover the territory west of Gasport. George C. Andrews, Resident Engineer, is in charge, with office at Lockport.

This division is unique in the fact that much of the new alignment is substantially identical with that of the existing canal and requires heavy winter construction. During the past winter season, work to the value of about $2,500,000 was thus performed under the peculiar difficulties incident upon operation at low temperatures.

The following reports of the resident engineers give in detail the condition and progress of construction:

ERIE CANAL, RESIDENCY NO. 8.

Resident Engineer B. E. Failing reports:

" This residency embraces the entire length of the Barge canal through Wayne county and extends from the southerly line of the county, at the southeastern corner of the town of Galen, to the westerly line, about one-half mile west of the village of Wayneport, Wayne county. Construction work on Residency No. 8 is divided into nine contracts, viz., Nos. 47, 48, 49, 76, 77, 84, 89, 94 and 108.

"*Contract No.* 47.

" Contract No. 47 extends from the southeast corner of the town of Galen, at Sta. 5729 + 79.28, to a point near the New York Central and Hudson River railroad crossing at Lyons, at Sta. 6510 + 00. Length, 14.46 miles.

" This contract was let to the Crowell-Sherman Company, of Cleveland, Ohio, on November 30, 1908, and assigned soon after to the Crowell-Sherman-Stalter Company. The contract calls for completion on or before May 20, 1912.

" The contract has been modified by alterations as follows:

"Alteration No. 1, approved by the Canal Board July 1, 1909, changes the cross-section of lock wall, conduits for electric wires and specifications for miter-sills, and also provides for joints and ball-valves in floor of lock and increases the amount of clearing on the contract.

"Alteration No. 3, approved by the Canal Board November 16, 1910, provides for the removal of Glasgow street and Sodus street bridges at Clyde and the reërection on temporary foundation of the Sodus street bridge.

"Alteration No. 4, approved by the Canal Board December 27, 1910, provides for changing the plans for the east end of the lower approach wall at lock No. 26.

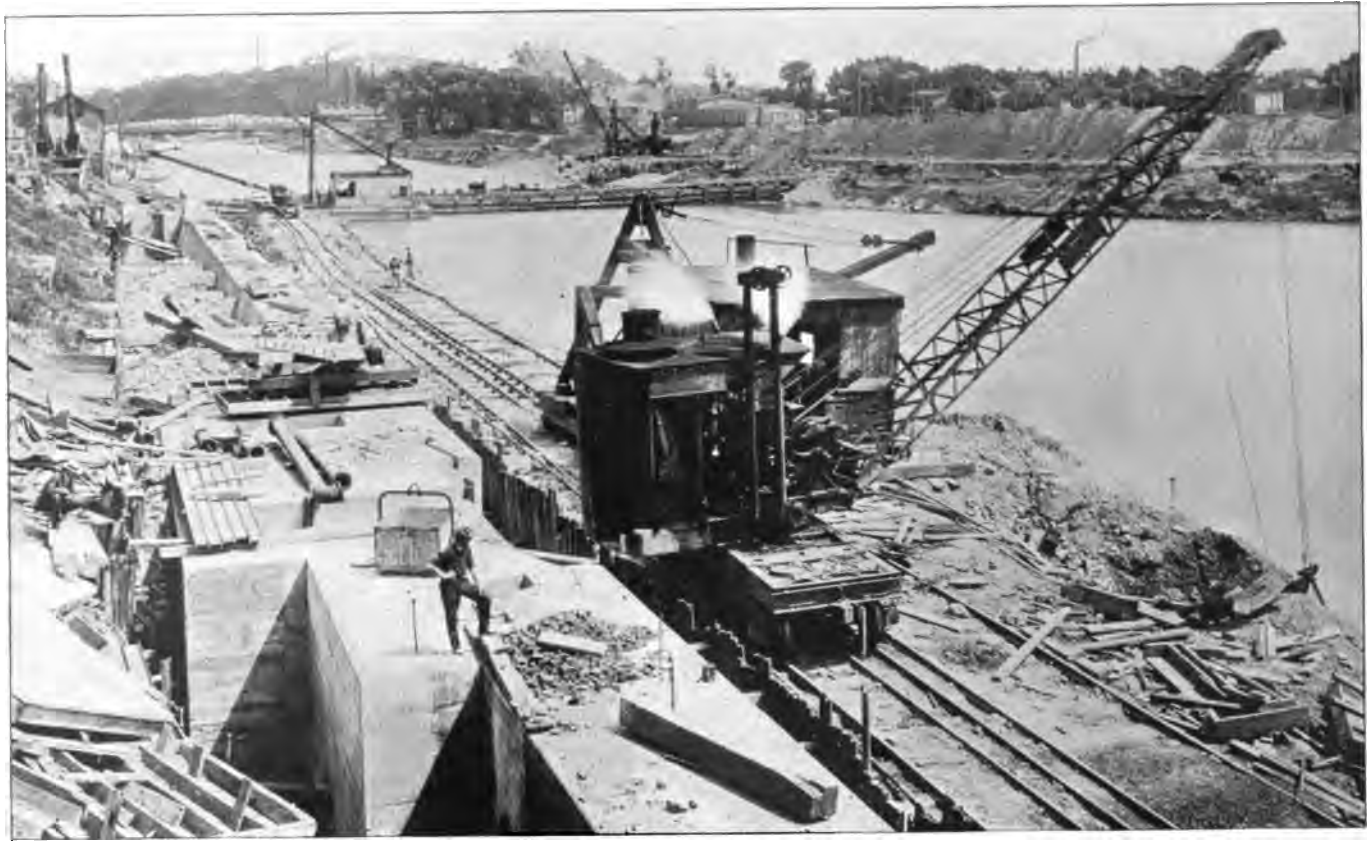
"Alteration No. 5, approved by the Canal Board April 6, 1911, provides for changing location of canal for about 600 feet at the west end of the contract.

"Alteration No. 6, approved by the Canal Board June 11, 1913, provides for eliminating the unfinished portions of the contract.

" No construction work has been done on this contract during the past year.

" The following table shows the percentage of work done to date, as affected by all alterations:

ITEMS OF WORK.	Prelimininary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing....acres	225	0	252	0	112
Grubbing....cu. yds.	890	0	750	0	84.4
Excavation....cu. yds.	5,310,950	0	3,160,608	0	59.6
Sheeting and bracing....ft. B. M.	25,000	0	28,000	0	112
Forming embankment....cu. yds.	31,950	0	19,221	0	60.3
Lining....cu. yds.	1,120	0	0	0	0
Sawed lumber, yellow pine or Douglas fir..ft. B. M.	4,000	0	3,000	0	75
Sawed lumber, hemlock....ft. B. M.	32,000	0	0	0	0
White oak in miter-sills....ft. B. M.	7,000	0	6,800	0	97.2
Sawed lumber, white oak....ft. B. M.	1,000	0	53	0	5.3
Round timber in cribs....lin. ft.	320	0	0	0	0
Stone filling in cribs....cu. yds.	410	0	0	0	0
Foundation piles....lin. ft.	4,200	0	5,755	0	136.9
Mooring piles....No.	8	0	8	0	100
Wooden sheet-piling....ft. B. M.	7,000	0	5,000	0	71.5
Second-class concrete....cu. yds.	23,689	0	22,019	0	93
Reinforced concrete....cu. yds.	113	0	107.7	0	95.4
First-class masonry, bridge coping....cu. yds.	2	0	1.65	0	82.6
Second-class stone paving....sq. yds.	50	0	37.7	0	75.5
Second-class riprap....cu. yds.	860	0	11.0	0	1.3
15-in. vitrified pipe....lin. ft.	865	0	937	0	108.2
Trenching and backfilling....lin. ft.	865	0	933	0	107.8
Structural steel....lbs.	158,100	0	145,312	0	91.8
Metal reinforcement....lbs.	24,500	0	24,644	0	100.6
Wrought iron....lbs.	2,425	0	1,927	0	79.5
Steel castings....lbs.	10,400	0	9,918	0	95.3
Iron castings, plain....lbs.	6,290	0	4,434	0	70.5
Iron castings, machined....lbs.	6,600	0	6,420	0	98.8
Wooden pavement....sq. yds.	330	0	322	0	97.7
Wooden fence....lin. ft.	925	0	0	0	0
Wrought iron pipe railing....lin. ft.	470	0	445	0	94.7
Sawed lumber in needles....ft. B. M.	14,000	0	12,900	0	92.2
Metal in lock-valves....lbs.	24,000	0	22,487	0	93 3
Metal in buffer-beams....lbs.	90,000	0	80,526	0	89.5
Metal in lock-gates....lbs.	180,000	0	169,481	0	94.2
Maintaining highway traffic....lump sum	1	0	0	0	0
Coffer-dams....lump sum	1	0	1	0	100
Removing of Glasgow st. and Sodus st. bridges, etc. lump sum	1	0	1	0	100
Gross estimate....	$1,279,327 60	0	$830,850 00	0	65



Barge Canal, Contract No. 48.
Building the north wall of lock No. 27, at Lyons.

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"*Contract No.* 84.

"Contract No. 84 consists of two lift bridges across the Barge canal, at Glasgow and Sodus streets, Clyde. The work on plans has been suspended, pending an investigation of a scheme for the elimination of the grade crossings of the New York Central and Hudson River and West Shore railroads at that point.

"*Contract No.* 48.

"Contract No. 48 extends from a point near the New York Central and Hudson River railroad crossing at Lyons, Sta. 6510, to a point near the West Shore railroad crossing at East Newark, Sta. 6813. Length, 5.75 miles.

"This contract has been modified by alterations as follows:

"Alteration No. 1, approved by the Canal Board July 19, 1911, provides for a change in the manner of removal of buildings from the site of the contract.

"Alteration No. 2, approved by the Canal Board January 31, 1912, provides for eliminating embankment on the south side of the canal from Sta. 6649 to Sta. 6678; for sheet-piling under embankment on north side from Sta. 6657 to Sta. 6666, and for shortening the lower approach wall of lock No. 28-A.

"Alteration No. 3, approved by the Canal Board June 11, 1912, provides for changing plans for power plant at lock No. 27.

"Alteration No. 4, approved by the Canal Board September 10, 1912, provides for sheet-piling under the embankment on the south side above lock No. 28-A.

"Alteration No. 5, approved by the Canal Board December 31, 1912, provides for changing plans for north approach to Geneva street bridge.

"Mr. F. W. Madigan, Assistant Engineer, is in charge of construction.

"This contract was let December 29, 1910, to the Crowell-Sherman-Stalter Company. Before any work was started on the contract, all the structures, except steel work, all prism work west of Sta. 6625 and the stream entrance at Mud creek were sublet to the Great Lakes Construction Company. The contract calls for completion on or before January 1, 1914.

"The hydraulic dredge *Lyons* resumed operation April 4 and finished June 16, after excavating 60,000 cu. yds., between the east end of the contract and Ganargua creek. The *Lyons* and the dipper dredge *Erie* were dismantled and removed from the contract July 8.

"The Geneva street bridge and its approaches were completed and opened for traffic November 28.

"The lower approach and north wall of lock No. 27 were completed in July. To complete the lock and build the other structures in that vicinity a coffer-dam was constructed and the by-pass excavated. Pumping was started August 12 and concrete was placed on September 12. Good progress was made, over 2,800 cu. yds. being placed during the balance of the month.

"The riprap protection at Ganargua creek stream entrance was completed.

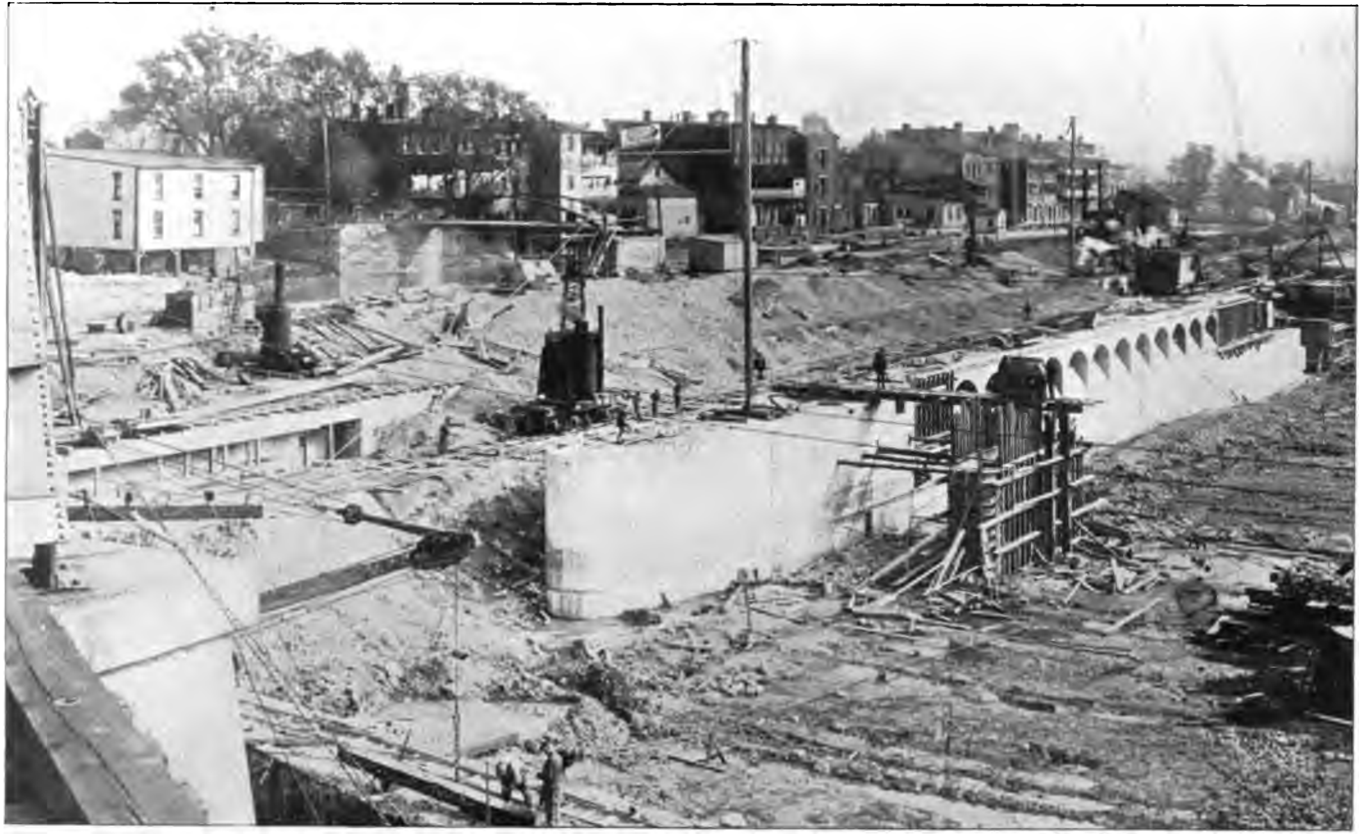
"At lock No. 28-A the work was closed down February 12 and resumed June 10. Both lock walls were completed early in July. On July 25 the Marion steam-shovel began excavating for the lock floor and the remaining prism east of the lock. This excavation is now above 75 per cent completed. The wooden sheet-piling just west of lock No. 28-A, under alteration No. 4, was completed. The excavator *Dreadnaught* completed about 4,500 lin. ft. of canal west of lock No. 28-A and closed down on August 20.

"The Browning crane and Marion shovel completed the prism from Sta. 6738 to Sta. 6790, except at the New York Central crossing.

"About 80 per cent of the wash wall on the contract is finished. The dive culvert at Sta. 6789 was completed, except the paving at the outlet.

"During the year the following extra work orders were completed: Placing lining on Forgham street; closing the old culvert at East Newark; removing machinery from the Lyon's mill, and building the stream entrance at Trout run.

"The contract with the Superintendent of Public Works for the highway at Burleys, started last year, was finished in November.



Barge Canal, Contract No. 48.
Building the south wall of lock No. 27, at Lyons.

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" The following table shows the percentage of work done during the fiscal year and to date, as affected by all alterations:

ITEMS OF WORK.	Preliminary estimate, as affected by all alterations to date.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing....acres	67	2	52	3	77.6
Excavation....cu. yds.	1,992,600	375,394	1,580,219	18.8	79.3
Sheeting and bracing, first-quality...ft. B. M.	193,000	32,200	125,100	16.7	64.8
Sheeting and bracing, second-quality..ft. B. M.	229,000	83,400	105,600	36.4	46.1
Forming embankment....cu. yds.	229,707.33	69,529	173,093	30.2	75.4
Lining....cu. yds.	690	295	549	42.8	79.5
Puddle....cu. yds.	950	275	465	29	49
Sawed lumber, yellow pine or Douglas fir ft. B. M.	30,800	27,300	29,200	88.7	94.9
Foundation piles....lin. ft.	32,260	420	12,712	1.3	39.6
Wooden sheet-piling....ft. B. M.	306,000	47,326	130,066	15.4	42.5
Second-class concrete....cu. yds.	57,910	20,385	41,514	35.2	71.8
Reinforced concrete....cu. yds.	702	309	517	44	73.6
First-class masonry bridge coping.....cu. yds.	4.7	0	4.55	0	96.8
Wash wall....cu. yds.	27,270	10,821	14,739	39.8	54.2
First-class stone paving....sq. yds.	80	0	77	0	96.3
Second-class stone paving....sq. yds.	2,320	1,121	1,490	48.3	64.4
Second-class riprap....cu. yds.	950	801	801	84.3	84.3
Steel sheet-piling, first-quality....sq. ft.	24,000	0	32,986	0	137.3
Steel sheet-piling, second-quality....sq. ft.	120,000	29,391	49,028	24.5	40.8
Structural steel....lbs.	396,410	7,310	347,488	1.8	87.6
Metal reinforcement....lbs.	89,980	51,388	76,623	57.1	85.1
Wrought iron....lbs.	4,400	-300	0	-6.8	0
Steel castings....lbs.	3,300	1,550	3,100	46.9	93.9
Iron castings, plain....lbs.	24,330	8,151	8,476	33.5	34.8
Iron castings, machined....lbs.	23,240	12,448	16,598	53.5	71.4
Portland cement sidewalk....sq. ft.	1,720	1,643	1,643	95.5	95.5
Wood block pavement....sq. yds.	330	321	321	97.3	97.3
Stone curb....lin. ft.	160	81	152	50.6	95
Resetting stone curb....lin. ft.	270	44	259	16.3	95.9
Medina sandstone pavement....sq. yds.	34	27	27	79.4	79.4
Macadam pavement....sq. yds.	380	277	277	72.9	72.9
Relaying Medina sandstone pavement.sq. yds.	400	196	376	49	94
Wooden pavement....sq. yds.	280	0	264	0	94.4
Wooden fence....lin. ft.	1,240	307	1,708	24.7	137.7
Lattice railing....lin. ft.	320	0	312	0	97.6
Metal in lock-gates....lbs.	438,000	4,610	4,916	1	1.1
Metal in buffer-beams....lbs.	173,000	17,999	24,027	10.4	13.8
Metal in lock-valves....lbs.	68,500	851	1,293	1.2	1.9
Maintaining highway traffic....lump sum	1	50%	100%	50	100
Maintaining navigation....lump sum	1	40%	70%	40	70
Coffer-dams, pumping, etc....lump sum	1	26%	48%	26	48
Deduct price to be paid State for buildings in place....	....	0	100	0	100
Gross estimate....	$1,679,265.95	$396,770.00	$123,191.00	23.6	73.4

" Contract No. 89.

" This contract consists of the superstructures for the bridges at Limerick street, Palmyra, contract No. 77; Main street, East avenue and below lock No. 28-B, Newark, contract No. 76; and superstructures, abutments and approaches for bridge at Forgham street, Lyons, contract No. 48.

" The contract was let May 28, 1912, to the Owego Bridge Company of Owego, N. Y., and called for completion on or before June 1, 1913. The engineering work is handled by the assistant engineers in charge of the contracts adjacent to the several structures.

" Early in the year the abutments of the Forgham street bridge were commenced and completed in January of 1913. Later in the year the bridges at Limerick street, Palmyra, and at lock No. 28-B, Newark, have been completed.

" The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate, as affected by all alterations to date.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining. . lump sum	1	1	1	100	100
Excavation. . . . . cu. yds.	1,760	687	687	39	39
Forming embankment for bridge approaches. . . . cu. yds.	1,590	592	592	37.2	37.2
Lining. . . . . cu. yds.	70	0	0	0	0
Sawed lumber, treated, yellow pine. . . . . ft. B. M.	22,000	18,846	18,846	85.6	85.6
Foundation piles. . . . . lin. ft.	1,760	1,806	1,806	102.6	102.6
Second-class concrete. . . . . cu. yds.	250	226	226	90.4	90.4
Reinforced concrete. . . . . cu. yds.	490	120	120	24.3	24.3
First-class masonry bridge coping. . . . . cu. yds.	3	0	0	0	0
Structural steel. . . . . lbs.	1,000,000	277,744	277,744	27.8	27.8
Metal reinforcement. . . . . lbs.	100,000	13,751	13,751	13.7	13.7
Wood block pavement. . . . . sq. yds.	970	158	158	16.3	16.3
Wooden fence. . . . . lin. ft.	160	0	0	0	0
Lattice railing. . . . . lin. ft.	940	322	322	34.2	34.2
Gross estimate.	$65,116	$18,630	$18,630	28.6	28.6

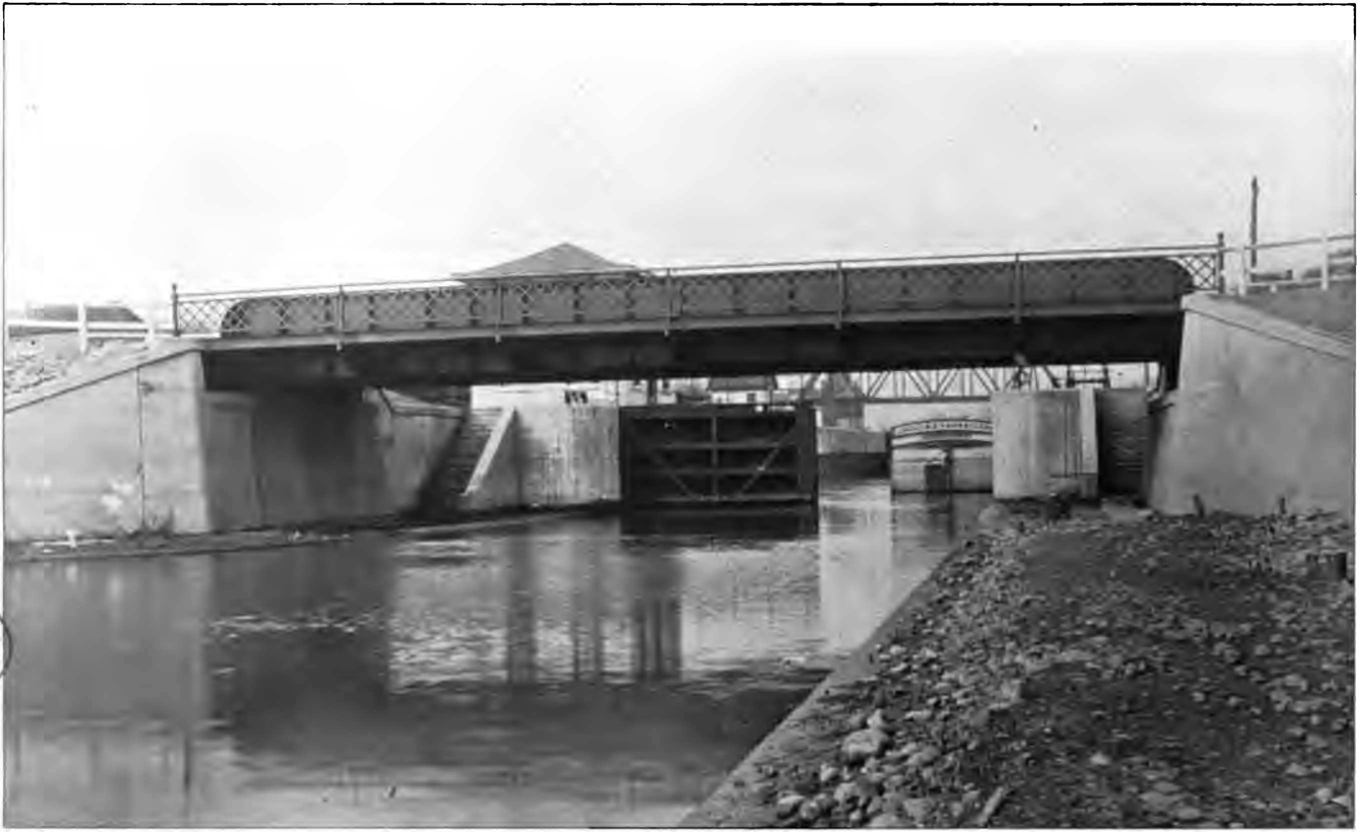
" *Contract No.* 108.

" Contract No. 108 is for the construction of a substructure and superstructure for a bridge at Macedon, Sta. 7500 on contract No. 49, and at Edgett street, Sta. 6906 at Newark on contract No. 76, and for a bridge superstructure at Peeks, Sta. 6984 + 58, about two miles west of Newark, on contract No. 76.

" Plans for this work have been completed and bids advertised for.

" *Contract No.* 76.

" Contract No. 76 extends from a point near the West Shore railroad crossing at East Newark, Sta. 6813, to a point about one-half mile east of Port Gibson, Sta. 7045. Length, 5.77 miles.



Barge Canal, Contract No. 76.
Completed lock No. 28-B, at Newark.

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" This contract has been modified by alterations as follows:

"Alteration No. 1, approved by the Canal Board April 26, 1911, provides for a change in the manner of removal of buildings from the site of the contract.

"Alteration No. 2, approved by the Canal Board June 8, 1911, provides for a change in the plans for lower approach walls of lock No. 28-B.

"Alteration No. 3, approved by the Canal Board July 19, 1911, provides for wooden sheet-piling under north embankment between Stas. 6998 + 33.5 and 7045.

"Alteration No. 4, approved by the Canal Board April 22, 1913, provides for the elimination of the work remaining to be done on Allerton's highway bridge.

"Alteration No. 5, approved by the Canal Board August 19, 1913, provides for two catch basins and drains for Van Buren street and for substituting brick for macadam pavement on south approach to East avenue bridge.

" Carl Ashley, Assistant Engineer, is in charge of construction.

" Work on this contract is completed, save for some minor cleaning up, and the contractor has removed the bulk of his plant and force from the work. The final estimates are being pushed to completion.

" The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate, as affected by all alterations to date.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... lump sum	1	100%	100%	100	100
Excavation .... cu. yds.	2,131,980	878,694	1,981,144	41.2	92.9
Forming embankment .... cu. yds.	164,580	23,551	135,270	14.4	82.2
Lining .... cu. yds.	1,090	422	728	38.7	66.7
Sawed lumber, yellow pine or Douglas fir. ft. B. M.	12,400	9,100	9,100	73.4	73.4
Sawed lumber, white oak .... ft. B. M.	7,000	0	5,400	0	77.2
Foundation piles .... lin. ft.	1,300	384	384	29.6	29.6
Mooring piles .... lin. ft.	350	128	128	36.5	36.5
Wooden sheet-piling .... ft. B. M.	479,400	0	420,700	0	87.7
Second-class concrete .... cu. yds.	34,748	9,772	33,944	28.1	97.7
First-class masonry bridge coping .... cu. yds.	11.2	10.6	10.6	94.6	94.6
Wash wall .... cu. yds.	29,500	28,204	28,204	95.6	95.6
First-class stone paving .... sq. yds.	100	96	96	96	96
10-inch vitrified pipe .... lin. ft.	560	417	515	74.4	92
Structural steel .... lbs.	39,040	20,574	36,112	52.7	92.5
Metal reinforcement .... lbs.	14,200	30	14,001	0.1	98.3
Iron castings, plain .... lbs.	18,555	16,347	17,583	88.1	94.8
Iron castings, machined .... lbs.	6,900	0	6,560	0	95
Portland cement sidewalks .... sq. ft.	10,980	11,322	11,322	103.1	103.1

ITEMS OF WORK.	Preliminary estimate, as affected by all alterations to date.	Work done during year.	Total work done during date.	Per cent of work done during year.	Per cent of work done to date.
Stone curbs .... lin. ft.	2,070	2,034	2,034	98.3	98.3
Cobblestone pavement .... sq. yds.	295	298	298	101	101
Macadam pavement .... sq. yds.	2,810	2,829	2,829	100.6	100.6
Brick pavement .... sq. yds.	1,390	1,505	1,505	108 2	108.2
Wooden fence .... lin. ft.	3,170	2,007	2,257	63.3	71.2
Metal in lock-gates .... lbs.	198,000	849	186,301	0.4	94.1
Metal in buffer-beams .... lbs.	85,000	3,906	73,906	4.6	86.9
Metal in lock-valves .... lbs.	25,000	5,533	23,953	22.1	95.8
Sluice-gate, 5 ft. x 7 ft. in place. .... No.	1	1	1	100	100
Maintaining highway traffic .... lump sum	1	100%	100%	100	100
Maintaining navigation .... lump sum	1	25%	100%	25	100
Removing old bridge superstructures .. lump sum	1	66⅔%	100%	66⅔	100
Coffer-dams, pumping, etc .... lump sum	1	45%	100%	45	100
Deduct price to be paid State by contractors for buildings in place .... No.	84	2	86	2.3	102.3
Gross estimate	$1,491,880 10	$584,850	$1,375,720	39.2	92.2

"*Contract No. 77.*

" Contract No. 77 extends from a point about one-half mile east of Port Gibson, Sta. 7045, to about one-half mile west of Palmyra, Sta. 7400. Length, 6.78 miles.

" This contract has been modified by alterations as follows:

"Alteration No. 1, approved by the Canal Board April 26, 1911, provides for a change in the manner of removing buildings from the site of the contract.

"Alteration No. 3, approved by the Canal Board July 19, 1911, provides for wooden sheet-piling under north embankment from Sta. 7045 to Sta. 7105.

"Alteration No. 4, approved by the Canal Board January 31, 1912, provides for a change in plan for concrete slab approach for Galloway's highway bridge.

"Alteration No. 5, approved by the Canal Board March 11, 1912, provides for changing side slopes of prism and for wooden sheet-piling under embankments at certain points.

"Alteration No. 6, approved by the Canal Board July 11, 1912, provides for protection at Port Gibson bridge and material for embankment.

" Carl Ashley, Assistant Engineer, is in charge of the construction.

" The work on this contract has been practically completed during the year and practically the only plant left on the job is the suction dredge *Palmyra,* which is doing some cleaning up. An alteration covering some additional work is proposed, but with the slight extension in time already granted the work will probably be completed on time.

" The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate, as affected by all alterations to date.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing....acres	70	25.5	75.5	36.4	107.8
Excavation....cu. yds.	2,643,610	499,316	2,330,914	18.8	88 2
Sheeting and bracing....ft. B. M.	44,000	12,600	86,800	28.6	197.3
Forming embankment....cu. yds.	194,480	74,296	143,678	38.2	73.8
Lining....cu. yds.	1,470	598.6	872.3	40.6	59.3
Sawed lumber, yellow pine or Douglas fir ft. B. M.	24,000	12,799	17,611	53.3	73.4
Sawed lumber, hemlock....ft. B. M.	3,000	1,800	1,800	60	60
Sawed lumber, white oak....ft. B. M.	7,600	6,500	6,500	85.5	85.5
Foundation piles....lin. ft.	35,500	2,848	24,510	8	69
Mooring piles....lin. ft.	400	144	144	36	36
Wooden sheet-piling....ft. B. M.	690,000	0	619,445	0	89.7
Second-class concrete....cu. yds.	43,930	4,349.6	45,687	9.9	104
Reinforced concrete....cu. yds.	383	24.9	371.8	6.5	97.1
First-class masonry bridge coping....cu. yds.	11	10.1	10.1	91.8	91.8
Wash wall....cu. yds.	47,500	39,430.4	44,348	83	93.3
First-class stone paving....sq. yds.	70	0	63	0	90
Second-class stone paving....sq. yds.	940	79.8	761.9	8.5	81
Second-class riprap....cu. yds.	150	0	91.7	0	61.1
Third-class riprap....cu. yds.	3,000	1,689.7	2,251.5	56.3	75
Structural steel....lbs.	702,380	67,497	670,339	9.6	95.4
Metal reinforcement....lbs.	54,000	4,907	52,329	9.1	96.9
Steel castings....lbs.	3,300	0	3,065	0	92.9
Iron castings, plain....lbs.	13,200	11,324	12,480	85.8	94.8
Iron castings, machined....lbs.	8,600	0	8,300	0	96.6
Portland cement sidewalks....sq. ft.	3,430	3,264	3,264	95.1	95.1
Stone curbs....lin. ft.	1,800	1,712.8	1,712.8	95.1	95.1
Macadam pavement....sq. yds.	2,230	2,123.4	2,123.4	95.2	95.2
Paved gutters....sq. yds.	480	296.4	296.4	61.7	61.7
Wooden pavement....sq. yds.	1,380	534	1,305	38.7	94.5
Wooden fence....lin. ft.	6,700	4,226.7	4,226.7	63.1	63.1
Lattice railing....lin. ft.	420	0	400	0	95.4
Metal in lock-gates....lbs.	206,000	28,168	199,188	13.6	96.7
Metal in lock-valves....lbs.	34,000	32,435	32,435	95.4	95.4
Metal in buffer-beams....lbs.	86,000	3,294	72,461	3.8	84.2
Metal in guard-gates....lbs.	264,000	167,033	167,033	63.2	63.2
Removing old bridge superstructure at Maple Ave....lump sum	1	0	1	0	100
Maintaining highway traffic....lump sum	1	20%	100%	20	100
Sluice-gates, 36 in. by 60 in....No.	3	3	3	100	100
Sluice-gates, 60 in. by 84 in....No.	3	0	3	0	100
Maintaining navigation....lump sum	1	25%	100%	25	100
Coffer-dams, pumping, bailing....lump sum	1	14%	100%	14	100
Material for embankment....lump sum	1	100%	100%	100	100
Deduct price to be paid State by contractor for buildings....No.	21	0	25	0	119
Deduct sheeting and bracing reused..ft. B. M.	0	12,600	39,200	......	....
Gross estimate....	$1,701,807 55	$385,750	$1,562,020	22.7	91.8

"*Contract No.* 49.

" Contract No. 49 extends from a point about 500 feet east of Yellow Mills bridge to the Wayne-Monroe county line. Length, 6.8 miles.

" This contract was let February 26, 1910, to the Bellew & Merritt Company, who afterward sublet all but lock No. 30 to Fitzgerald & Caldwell. On October 5, 1911, the contract was assigned to the American Pipe and Construction Company. The contract called for completion on or before May 1, 1912, but has been extended to May 1, 1913, and then extended to May 1, 1914.

" The contract has been modified by alterations as follows:

"Alteration No. 1 changes the south approach to Frear's bridge and the electrical equipment for lock No. 30. This alteration was approved by the Canal Board September 8, 1910.

"Alteration No. 2, approved by the Canal Board December 11, 1911, provides for the elimination of the wash wall west of lock No. 30.

"Alteration No. 3, approved by the Canal Board March 11, 1912, provides for lining in front of Waynesport and Frear's bridge abutments.

"Alteration No. 4, approved by the Canal Board March 11, 1912, provides for substituting spoil for embankment, and sheet-piling from the upper end of the north upper approach wall of lock No. 30 to Sta. 7545 + 93.

"Alteration No. 5, approved by the Canal Board June 11, 1912, provides for constructing the south approach to Frear's bridge as embankment.

"Alteration No. 6, approved by the Canal Board December 30, 1912, provides for modifying the plan for the bulkhead in old lock No. 61.

" H. N. Metzger, Assistant Engineer, is in charge of construction.

" This contract is nearing completion and there remains only some prism excavation and the by-pass entrance below old lock No. 61, which will be finished after the closing of navigation this year.

"The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate, as affected by all alterations to date.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing........acres	220	0	204	0	92.2
Excavation........cu. yds.	1,546,500	265,736	1,235,147	17.1	83.1
Sheeting and bracing........ft. B. M.	260,000	31,000	122,000	11.9	46.9
Forming embankment........cu. yds.	31,850	0	18,366	0	57.7
Lining........cu. yds.	5,700	1,590	4,060	27.9	71.2
Sawed lumber, yellow pine or Douglas fir ft. B. M.	20,600	1,000	18,000	4.8	87.3
Sawed lumber, white oak........ft. B. M.	4,000	5,000	7,000	125	175
Sawed lumber in needles........ft. B. M.	11,000	11,900	11,900	108.2	108.2
Foundation piles........lin. ft.	18,400	3,172	15,111	17.2	82.1
Mooring piles........lin. ft.	400	162	162	40.5	40.5
Wooden sheet-piling........ft. B. M.	1,520,000	20,000	1,557,000	1.3	102.4
Second-class concrete........cu. yds.	31,250	2,766	29,270	8.8	93.6
Reinforced concrete........cu. yds.	250	0	213	0	85.3
First-class masonry bridge coping........cu. yds.	7.5	4	7	53.3	93.3
Wash wall........cu. yds.	15,000	4,008	14,426	26.7	96.2
Second-class stone paving........sq. yds.	680	327	477	48.1	70.2
Cobblestone paving........sq. yds.	320	165	355	51.6	110.9
Structural steel........lbs.	480,400	2,246	457,274	0.5	95.2
Metal reinforcement........lbs.	28,400	606	25,995	2.1	91.5
Steel castings........lbs.	16,000	11,319	14,583	70.7	91.1
Iron castings, plain........lbs.	600	0	578	0	96.4
Iron castings, machined........lbs.	9,000	0	8,136	0	90.4
Wooden pavement, 3¼ in. thick........sq. yds.	170	0	166	0	97.7
Wooden pavement, 2¾ in. thick........sq. yds.	960	0	914	0	95.2
Wooden fence........lin. ft.	3,875	3,246	3,580	83.8	92.3
Lattice railing........lin. ft.	82	84	129	102.4	157.3
Metal in lock-gates........lbs.	206,000	1,097	194,837	0.5	94.5
Metal in buffer-beams........lbs.	86,000	22,077	79,877	25.6	92.9
Metal in lock-valves........lbs.	34,000	1,221	32,422	3.6	95.4
Removing old bridge superstructures. lump sum	1	0	1	0	100
Maintaining highway traffic........lump sum	1	35%	100%	35	100
Maintaining navigation........lump sum	1	3%	100%	3	100
Coffer-dams, pumping, bailing and draining... lump sum	1	79%	100%	79	100
Removing and replacing Frear's bridge superstructure........lump sum	1	100%	100%	100	100
Gross estimate........	$735,227 25	$100,480	$644,180	13.7	87.6

"*Contract No.* 94.

"Contract No. 94 is for power plants, electrical equipment and machinery for operating and lighting locks as follows: Erie canal, locks Nos. 26, 27, 28-A, 28-B, 29, 30, 32, 33 and 34–35; guard-lock, Sta. 2413 + 42, and guard-lock, Sta. 2468 + 48, near the Genesee river.

"This contract was let to MacArthur Brothers Company and Lord Electric Company, both of New York city, on February 17, 1913.

"The contract calls for completion as follows: The operating machinery for valves and gates shall be installed and ready for hand operation at locks Nos. 28-B, 29 and 30 on or before May

1, 1913, or the contractor shall at his own expense operate these valves and gates sufficiently to accommodate Erie canal navigation to the satisfaction of the Superintendent of Public Works from May 15, 1913, until the operating machinery is ready for hand operation. The operating machinery for valves and gates on the remaining locks shall be installed and ready for hand operation on or before May 1, 1914. The remainder of the work shall be completed on or before November 1, 1914.

"The engineering work is handled by the assistant engineers in charge of the contracts adjacent to the several structures.

" The power houses at locks Nos. 26, 28-B and 29 have been completed and the transmission line poles between locks Nos. 29 and 30 have been placed.

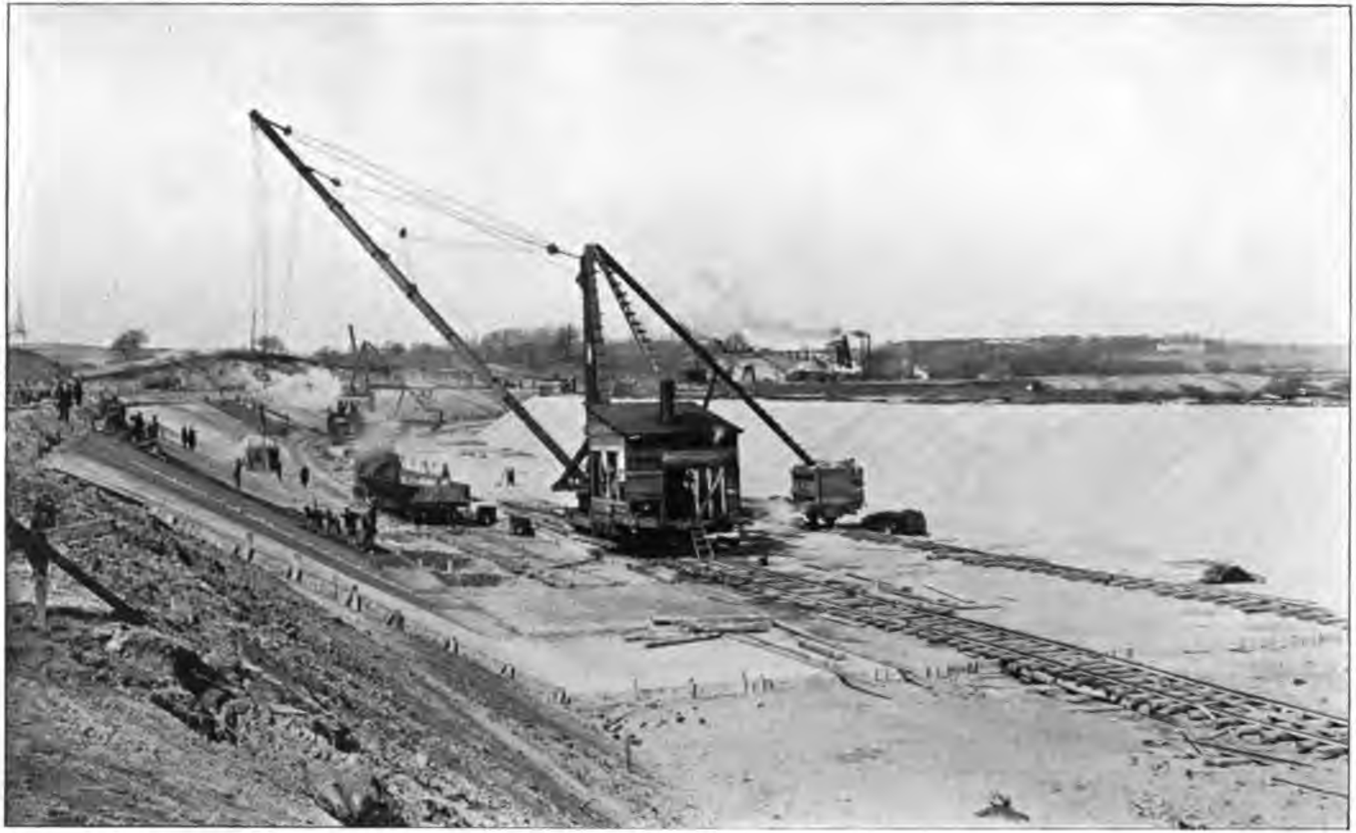
" The table giving the amount done on the whole contract is included in the report of Residency No. 9."

ERIE CANAL, RESIDENCY NO. 9.

Supervising Engineer H. J. Knoppel reports:

" This residency includes the entire length of the Barge canal within Monroe county, a distance of approximately 40 miles; also the branch in the Genesee river from the canal crossing to the Court street dam, a distance of about 2 miles.

" Construction work on Residency No. 9 has been divided into the following contracts: Nos. 63, 38, 41, 23, 59, 21, 82, 6, 60 and 61 and portions of contracts Nos. 75, 105, 106, 112, 113 and 94. Of these, contracts Nos. 38, 41 and 6 were completed previous to the past fiscal year. Contracts Nos. 60, 61, 75, 105 and 112 have been completed during the past year. Contracts Nos. 111, 59 and 106 have not yet been awarded. Of the remaining contracts, work is progressing on contracts Nos. 63, 23 and 113. No work has been done on contract No. 82 during the past fiscal year. Work on contract No. 21 was suspended by the contractor in August, 1913, and the contract was canceled by the Canal Board as of date September 30, 1913. Work on contract No. 94 within this residency has not yet begun. Preparation of final estimates of contracts Nos. 61 and 105 is in progress; that for contracts Nos. 60, 75 and 112 has been completed.



BARGE CANAL, CONTRACT NO. 63.

Canal prism in embankment section at Bushnell's Basin, with bottom and slopes lined with concrete as a precaution against breaks.

" The total amount of work under contract, including completed work, is $10,144,933.09; total earned to September 30, 1913, is $8,318,267.21; total earned during the year, $1,603,713.24; percentage done to date, 82 per cent; during the year, 15.8 per cent.

" Outside of construction work, a number of appropriation surveys have been made and the ' Blue line ' survey of the existing canal in and near Rochester that will be cut off by the new line has been continued and nearly completed.

" Daily gage readings have been taken of the water stage of the Genesee river at Elmwood avenue bridge. In this connection it is interesting to note that the spring flood of 1913 in the Genesee river reached the highest stage since 1865. The reading in the river at the proposed Barge canal crossing was elevation 523.85, as against the proposed pool level of elevation 512.6 and a possible maximum protection (if the gates were to be built to the level of the tops of walls) of elevation 526.0 afforded by the new guard-locks on contracts No. 21 and 23.

" The progress of construction work is shown by the following information and data:

" *Contract No.* 63.

" This contract provides for the improvement of the Erie canal from the west line of Wayne county to the east end of contract No. 23, at King's Bend, a distance of 12.22 miles. C. R. Waters, Carl Ashley and A. P. Mussi, Assistant Engineers, have been in charge at different times.

" The contract was let to H. S. Kerbaugh, Inc., of Philadelphia, Pa., on June 13, 1910.

" This contract has been modified by alterations as follows:

" Alteration No. 1, approved by the Canal Board June 8, 1911, changes Knapp's highway bridge to permit elimination of railroad grade crossing.

" Alteration No. 2, approved by the Canal Board September 27, 1911, increases thickness of prism floor at Irondequoit embankment and for building new culvert at west end of contract.

" Alteration No. 3, approved by the Canal Board November 16, 1911, changes plans for prism protection and lining at various points to insure stability of banks.

" Alteration No. 4, approved by the Canal Board March 11, 1912, provides new waste-weir at Fairport to replace old structure and eliminates waste-gate, etc., just west of Fairport.

" Alteration No. 5, approved by the Canal Board March 27, 1912, changes plans for Monroe avenue bridge to provide sidewalks and better type of floor.

" Alteration No. 6, approved by the Canal Board March 27, 1912, provides two temporary timber guard-gates, pending completion of permanent gates.

"Alteration No. 7, approved by the Canal Board July 30, 1912, provides for north approach to Knapp's bridge and better floors for Knapp's, Cartersville, Wiltsie's and Main street bridges.

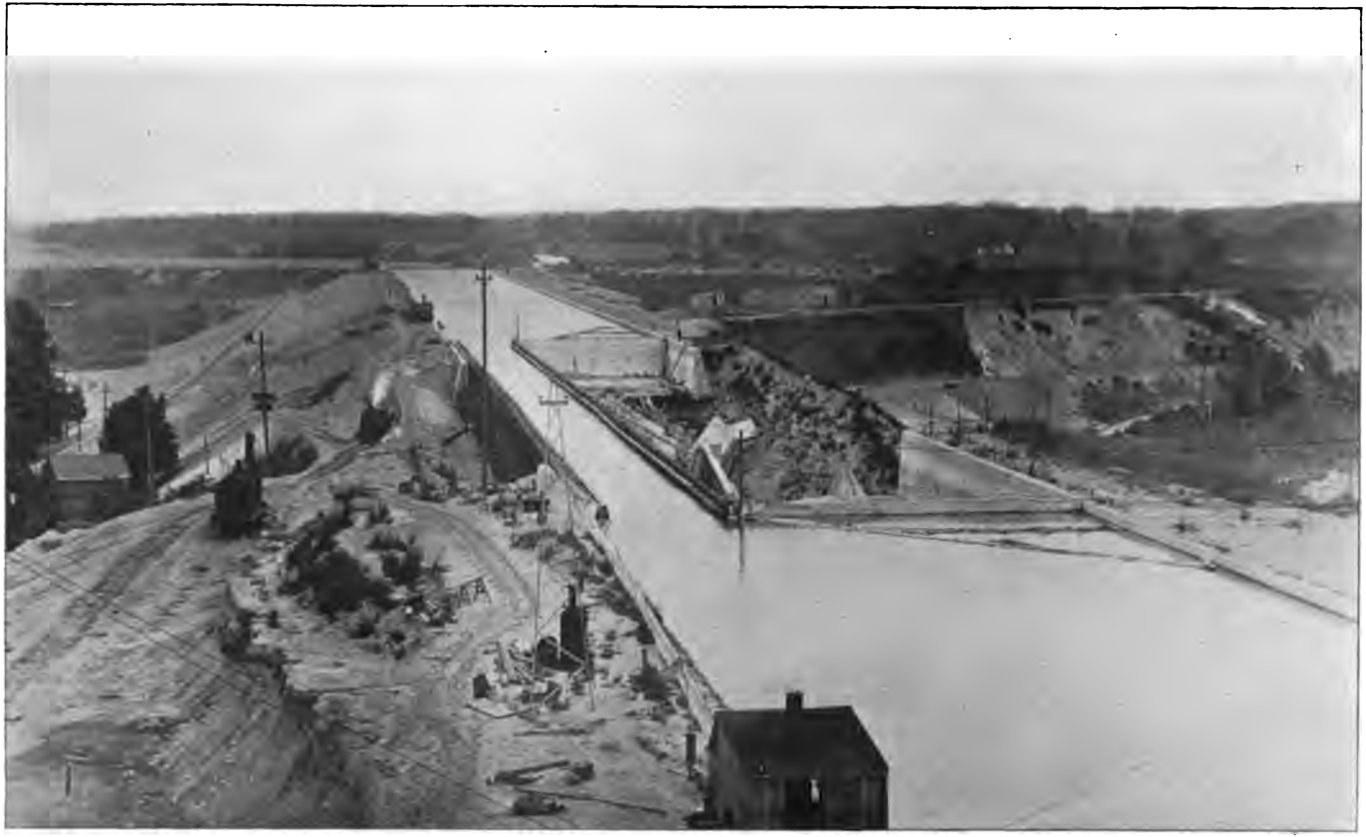
" Alteration No. 8, approved by the Canal Board October 22, 1912, changes type of floor for Fullam's Basin bridge to secure better construction.

"Alteration No. 9, approved by the Canal Board December 11, 1912, changes details of lift-bridge at Fairport to secure better construction.

" Alteration No. 10, approved by the Canal Board February 6, 1913, changes prism protection and lining near Bushnell's Basin to insure stability of banks.

" Alteration No. 11, approved by the Canal Board March 19, 1913, for reinforcing high embankment at Irondequoit and for spoil in Cartersville widewaters to reduce leakage; for lengthening culvert No. 29 on account of widened spoil bank, and for steel sheet-piling in tow-path bank to prevent leakage.

" Excavation of prism and for structures has been continued with various plants as follows: The hydraulic dredge *Fairport,* operated by electric power from Niagara Falls, worked for one month previous to November 15, 1912, and for six weeks immediately preceding September 30, 1913, excavating the prism east of Fairport and in the Fairport cut-off. A Lidgerwood excavator operated a few weeks in the fall of 1912, excavating on the tow-path side, where its output could be cast into adjacent embankment. During the closed season of navigation in the winter of 1912–13, from two to five steam-shovels, with attendant trains of 6-yard cars and locomotive, excavated in the prism at various places, chiefly in the Fairport cut-off, where the spoil was filled in the old canal, and at Bushnell's Basin, where the material was



Barge Canal, Contract No. 63.
Concrete trough at the Irondequoit creek crossing, as repaired for use after the serious break of 1912, a temporary wooden trough being employed.

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used to back the existing banks. A clam-shell bucket and derrick mounted on a scow worked most of the past summer excavating in the prism and using the material to build the existing tow-path to grade. A so-called Fogarty excavator, with a heavy clam-shell bucket excavated to Knapp's bridge. At Bushnell's Basin excavation was completed early in the spring of 1913 and the concrete walls of trough and concrete slope lining were completed before the opening of navigation.

" During the year the Fairport waste-weir and dock wall were completed; also three bridges and the substructure for another. Steel work for the Bushnell's Basin guard-gate has been erected. Under an alteration 154,800 lin. ft. of 12-inch steel sheet-piling have been driven in the tow-path bank between Bushnell's Basin guard-gate and Fairport widewaters. Considerable new wash wall has been built and a large amount of old wall on the tow-path side has been topped out above the water level.

"All of the structures on this contract have been completed with the single exception of the superstructure of the Fairport lift-bridge and a small amount of paving in gutters and under approach slabs of a few of the bridges.

" There remains considerable prism excavation to be done, wash wall to be built and small items like concrete sidewalks, stone paving, fencing, etc., to be completed, and tow-path lining to be placed.

" The following table shows the amounts and percentages of work done during the year and total done to end of fiscal year:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining, miles	12.22	0.55	10.2	4.5	83.5
Clearing . . . lump sum	$1,000	$50	$1,000	5	100
Excavation . . . cu. yds.	3,071,365	792,827	2,473,276	25.8	80.5
Sheeting and bracing . . . ft. B. M.	*98,000	12,002	69,407	12.2	70.8
Round timber bracing . . . lin. ft.	500	356	356	71.2	71.2
Channeling . . . sq. ft.	20,000	0	0	0	0
Forming embankment . . . cu. yds.	534,755	246,816	552,622	46.2	103.3
Lining . . . cu. yds.	32,398	10,973	20,271	33.9	62.6
Puddle . . . cu. yds.	22,290	0	19,741	0	88.6
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	158,400	77,415	158,608	48.9	100.2
Creosoted lumber . . . ft. B. M.	22,000	489	22,489	2.2	102.2
Foundation piles . . . lin. ft.	17,690	0	7,913	0	44.7
Wooden sheet-piling . . . ft. B. M.	54,000	7,900	17,900	14.6	33.2
Second-class concrete . . . cu. yds.	98,762	34,728	101,628	35.2	102.9

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Third-class concrete cu. yds.	2,029	0	1,662	0	81.9
Reinforced concrete cu. yds.	2,741	1,368	2,480	49.9	90.5
First-class masonry bridge coping cu. yds.	31	7.9	21.2	25.5	68.4
Wash wall cu. yds.	72,546	17,683	31,780	24.3	43.8
Second-class stone paving sq. yds.	9,577	189	4,757	2	49.7
Third-class stone paving sq. yds.	2,048	1,049	1,070	51.2	52.2
Cobblestone paving sq. yds.	*1,786	666	1,728	37.3	96.7
Second-class riprap cu. yds.	22	0	0	0	0
Third-class riprap cu. yds.	250	76	222	30.4	88.8
Fourth-class riprap cu. yds.	7,930	369	6,392	4.6	80.6
Cast iron culvert pipe and specials lbs.	1,093,563	1,200	1,069,361	0.1	97.8
Structural steel lbs.	2,660,465	593,134	1,971,286	22.3	74.1
Metal reinforcement lbs.	728,964	279,739	715,056	38.4	98.1
Iron castings, plain lbs.	16,500	1,920	6,577	11.6	39.9
Expanded metal lbs.	6,100	112	5,288	1.8	86.7
Portland cement sidewalk sq. ft.	*8,550	2,435	4,751	28.5	55.6
Relaying flag sidewalk sq. yds.	45	0	0	0	0
Wooden pavement, 2¾ in. thick sq. yds.	818	0	804	0	98.3
Wooden pavement. 3¼ in. thick sq. yds.	614	0	611	0	99.5
Wooden block pavement sq. yds.	500	0	500	0	100
Wooden fence lin. ft.	12,135	6,386	11,413	52.6	94.1
Wrought iron pipe railing lin. ft.	986	434	712	44	72.2
Lattice railing lin. ft.	2,146	539	1,716	25.1	80
Rejointing old masonry lin. ft.	11,281	9,751	9,751	86.4	86.4
Drilling bolt holes in old masonry lin. ft.	107	15	27	14	25.2
Resetting pipe railing lin. ft.	230	0	0	0	0
Sluice-gates, 36 in. x 36 in No.	3	0	3	0	100
Sluice-gates, 24 in. x 24 in No.	4	4	4	100	100
Sluice-gate, 24 in. in diameter No.	1	0	1	0	100
Metal in guard-gates lbs.	465,000	155,700	455,700	33.5	98
Machinery for lift-bridge lbs.	78,000	0	0	0	0
Electrical equipment No.	1	0	0	0	0
Operator's cabin No.	1	0	0	0	0
Pump No.	1	0	0	0	0
Tar felt water proofing sq. ft.	649,460	267,411	623,522	41.2	96
Removing old bridge superstructures lump sum	$2,500	$1,050	$2,050	42	82
Maintaining navigation lump sum	$12,000	$1,800	$9,000	15	75
Maintaining highway traffic lump sum	$8,000	$1,280	$6,480	16	81
Sand filling cu. yds.	11,740	4,847	8,833	41.3	75.2
Taking up and relaying brick paving sq. yds.	220	0	0	0	0
Pumping, bailing and draining, alteration No. 4, lump sum	$250	$250	$250	100	100
Sawed lumber, hemlock ft. B. M.	*170,000	0	156,800	0	92.2
Steel sheet-piling lin. ft.	154,800	160,504	160,504	103.7	103.7
Gross estimate	*$2,669,101.06	$857,978.07	$2,279,169.64	32.1	85.4
Extra Work Orders.					
Dated May 23, 1911 cost + 15%	....	....	$173,267.19	......	Finished.
Dated July 27, 1911 cost + 15%	....	....	$10,598.67	......	Finished.
Dated March 11, 1912 cost + 15%	....	....	$3,485.68	......	Finished.
Dated Sept. 6, 1912 cost + 15%					
lumber cost + 10%	....	....	$169,937.36	......	Finished.
Dated Sept. 12, 1912 cost + 15%	$3,000.00	....	$3,149.14	......	Finished.
Dated Sept. 23, 1912 unit prices	$523.80	....	....	......	....
Dated Oct. 21, 1912 cost + 15%	....	....	$4,135.16	......	Finished.
Dated Jan. 23, 1913 cost + 15%	....	....	$1,461.74	......	Finished.
Dated March 25, 1913 cost + 15%	$2,121.00	....	....	......	....
Total	....	....	$366,034.94	......	....

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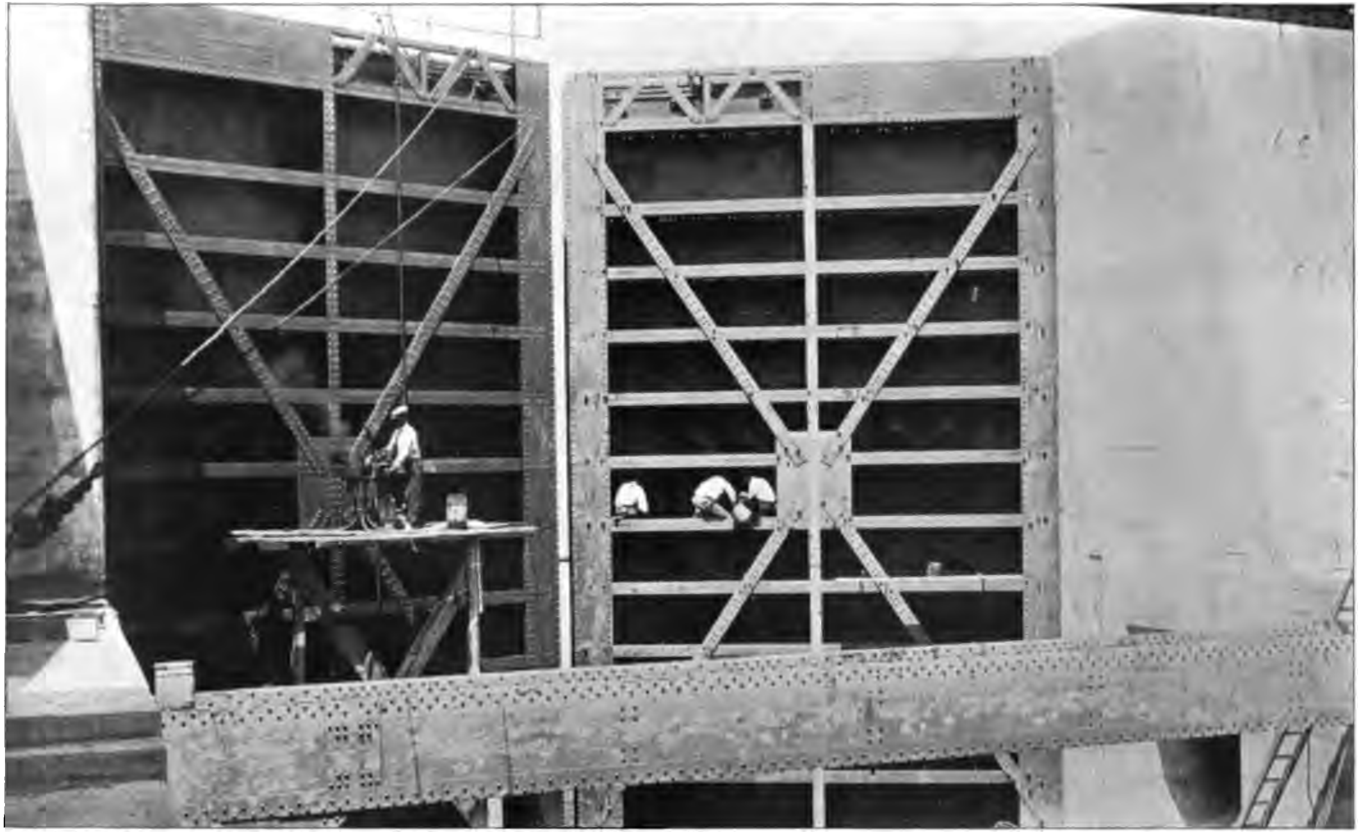
* Includes authorized increase over 15 per cent.



BARGE CANAL, CONTRACT NO. 23.
Erecting lower gates and buffer-beam at lock No. 33.

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"*Contract No.* 38.

"This contract provided for the construction of the superstructure, substructure and approaches for a highway bridge at Wappings, 2.5 miles west of Fairport. Henry Tosh and Son, of Port Byron, N. Y., were the contractors and the work was completed in August, 1909, the contract price being $16,669.90 and the final estimate, $16,286.67.

"This contract was modified by an alteration as follows:

"Alteration No. 1, approved by the Canal Board October 22, 1909, permits contractor to complete embankment from material outside of prism to expedite work and avoid interference with navigation; eliminates construction of culvert N as unnecessary.

"*Contract No.* 41.

"This contract provided for building embankments at Irondequoit creek crossing. Butler Bros. Construction Co. of New York city, were the contractors and the work was completed in March, 1911, the contract price being $274,917.50 and the final estimate, $241,644.

"This contract was modified by alterations as follows:

"Alteration No. 1, approved by the Canal Board April 27, 1909, changes location of Irondequoit creek diversion channel to provide better borrow pits and decrease amount of land appropriated.

"Alteration No. 2, approved by the Canal Board March 22, 1911, eliminates clay lining from west embankment on account of unsatisfactory material; provides for lining and fencing of highway on south side of embankment.

"*Contract No.* 23.

"This contract provides for the construction of a land line from King's Bend to the Genesee river, a distance of 5.63 miles. H. R. Wickham, Assistant Engineer, in charge. The contract was let to the Millard & Lupton Co., of Philadelphia, Pa., on August 18, 1909.

"This contract has been modified by alterations as follows:

"Alteration No. 1, approved by the Canal Board November 17, 1909, moves guard-lock westward to conform to railroad changes.

"Alteration No. 2, approved by the Canal Board September 8, 1910, eliminates pile foundation at lock No. 32, etc., as being unnecessary; provides roadway on spoil banks between Hillside avenue and South avenue; provides pull boxes for electric wires.

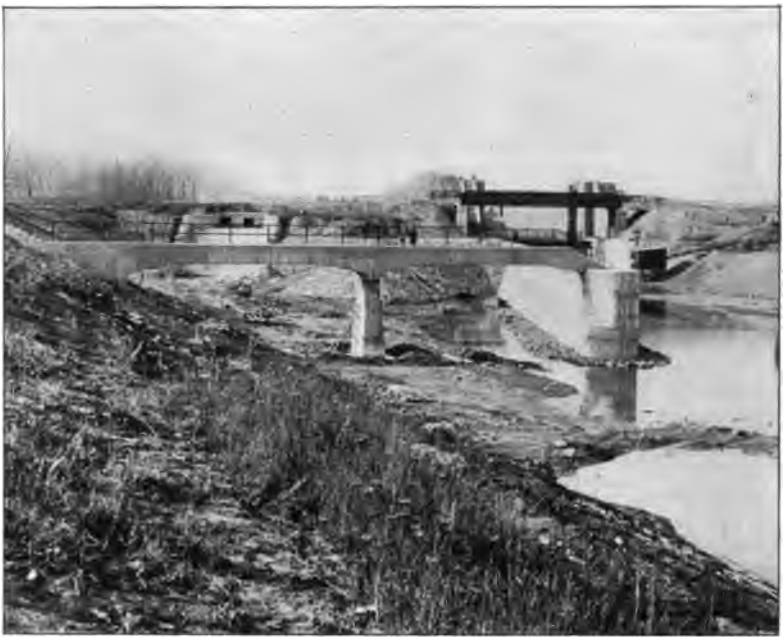
"Alteration No. 3, approved by the Canal Board July 19, 1911, omits pile foundation at lock No. 33, etc., as being unnecessary.

"Alteration No. 4, approved by the Canal Board September 10, 1912, changes type of bridge floors to provide better construction; changes guard-lock masonry to provide abutments for railroad bridge.

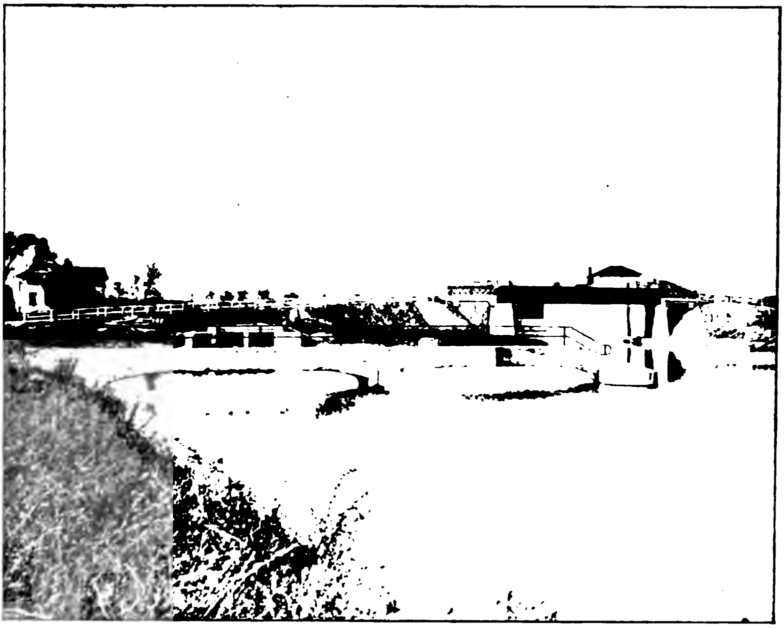
"Construction on this contract has progressed rather slowly the past year, principally because of the work being confined chiefly to excavation and numerous small items. From two to three 70-ton steam-shovels were in operation about 7½ months of the year excavating material in the prism and using the same partly in prism embankments, bridge approaches and backing of lock walls, and partly in spoil along side prism embankments. A Browning excavator has been fitted with a heavy clam-shell bucket attached to the end of a timber boom and is being used to trim prism slopes to the required 1 on 2 slope.

"Considerable amounts of wash wall, stone paving and riprap have been placed in position during the year. The concrete foot bridges across the lower tail-bay of by-passes at locks Nos. 32 and 33 have been completed, making lock No. 32 entirely completed save the lower lock-gates and valves and buffer-beams. These cannot be placed in position until the close of navigation, since operations on adjoining contract No. 63 have flooded lock No. 32 to lower pool level. Lock No. 33 is complete, including gates, valves and buffer-beams, but not including the concrete storehouse. All the bridges are complete and in use except that at South avenue, where the approaches are nearly completed.

"Prism excavation west of the guard-lock and the construction of that structure proper are still delayed by reason of complications at the Lehigh Valley and Erie railway crossings.



View at foot of lock No. 33, showing spillway and by-pass outlets and foot-bridge across their channel.



View of water in prism at foot of lock No. 32, where the structures are similar to those at lock No. 33.

BARGE CANAL, CONTRACT NO. 23.

" The following table shows the amounts and percentages of work done during the year and total done to end of fiscal year:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining, lump sum	$9,000	$2,250	$4,500	0.25	50
Clearing .... lump sum	$600	0	$492	0	82
Grubbing .... cu. yds.	*45,200	0	41,350	0	91.5
Excavation .... cu. yds.	2,935,870	306,868	2,118,093	10.5	72.1
Round timber bracing .... lin. ft.	3,000	0	0	0	0
Sheeting and bracing .... ft. B. M.	300,000	0	34,857	0	11.6
Lining .... cu. yds.	*6,260	949	2,582	15.2	41.2
Forming embankment .... cu. yds.	1,096,390	69,105	880,494	6.3	80.3
Sawed lumber, yellow pine or Douglas fir ft. B. M.	105,000	35,714	82,894	34	78
Sawed lumber, white oak .... ft. B. M.	16,000	0	2,376	0	14.8
Sawed lumber, in needles .... ft. B. M.	13,000	14,208	14,208	109.3	109.3
Foundation piles .... lin. ft.	68,145	0	3,934	0	5.8
Wooden sheet-piling .... ft. B. M.	75,100	0	33,660	0	44.8
Steel sheet-piling .... sq. ft.	4,500	0	1,156	0	25.7
Second-class concrete .... cu. yds.	80,985	725	62,468	0.9	77.1
Second-class reinforced concrete .... cu. yds	*930	113	821	12.2	88.3
First-class masonry coping .... cu. yds.	14	6	12	42.9	85.7
Dry retaining wall .... cu. yds.	39,400	0	0	0	0
Wash wall .... cu. yds.	38,200	4,414	6,183	11.6	16.2
Second-class stone paving .... sq. yds.	280	184	184	65.7	65.7
Third-class stone paving .... sq. yds.	3,380	303	303	9	9
First-class riprap .... cu. yds.	*350	261	261	74.6	74.6
Second-class riprap .... cu. yds.	810	355	497	43.8	61.4
Third-class riprap .... cu. yds.	770	160	395	20.8	51.3
Fourth-class riprap .... cu. yds.	5,210	2,471	3,069	47.4	58.9
Grouted riprap .... cu. yds.	1,125	890	890	79.1	79.1
Cast iron pipe and specials .... lbs.	43,600	0	45,130	0	103.5
Structural steel .... lbs.	920,000	202,612	791,139	22	86
Metal reinforcement .... lbs.	362,700	15,700	293,170	4.3	80.8
Iron castings, plain .... lbs.	97,800	9,300	34,621	9.5	35.4
Iron castings, machined .... lbs.	39,880	0	28,207	0	70.7
Metal in guard-lock gates .... lbs.	425,000	0	0	0	0
Metal in buffer-beams .... lbs.	170,000	90,208	99,084	53.1	58.3
Metal in lock-gates .... lbs.	525,600	286,404	310,378	54.5	59
Metal in lock-valves .... lbs.	140,000	83,190	83,696	59.4	59.8
Brick lining .... cu. ft.	17,400	0	6,347	0	36.5
Wooden pavement, 2½ in. thick .... sq. yds.	930	0	762	0	81.9
Wooden fence .... lin. ft.	12,800	3,348	4,782	26.2	37.4
Wrought iron pipe railing .... lin. ft.	230	162	162	70.4	70.4
Lattice railing .... lin. ft.	1,100	529	980	48.1	89.1
Storehouses .... No.	3	1	1	33.3	33.3
Office buildings .... No.	3	0	3	0	100
Gate hoists, light .... No.	2	0	0	0	0
Gate hoists, heavy .... No.	2	0	0	0	0
Maintaining highway traffic .... lump sum	$2,000	0	$1,360	0	68
Gross estimate	$1,829,338.60	$157,127.89	$1,181,415.46	8.6	64.6
Extra Work Orders.					
Dated Jan. 16, 1912 .... cost + 15%	....	....	$601.45	......	Finished.
Dated March 21, 1913 .... cost + 15%	....	....	$2,000 14	......	Finished.
Total	....	....	$2,601.59	......	......

* Includes authorized increases over 15 per cent.

" *Contract No.* 59.

" This contract will provide for the construction of a movable dam in the Genesee river at or near the existing Court street dam, to raise the river level to the established Barge canal pool. The contract has not yet been awarded.

" *Contract No.* 94.

" This contract provides for furnishing and installing all necessary hydro-electric equipment and machinery for operating and lighting the new locks on the Erie canal within the Western Division. The portion of the contract within this residency includes the power house equipment of lock No. 33, and lighting and operating equipment for locks Nos. 32 and 33 and two guard-locks at the Genesee river. H. R. Wickham, Assistant Engineer, has charge of construction work other than electrical within the limits of contract No. 23.

" This contract was let to MacArthur Brothers Company & Lord Electric Company, of New York city, on February 17, 1913.

" The only work done up to September 30, 1913, within the residency is the delivery of plant, form lumber and construction material.

" The following table shows the amounts and percentages of work done during the year and total done to end of fiscal year for the entire Western Division:

ITEMS OF WORK.	Preliminary estimate.	Work done during year and to date.	Per cent of work done during year and to date.
Coffer-dams, pumping, bailing and draining lump sum	$5,500	0	0
Excavation .... cu. yds.	720	406	56.4
Embankment .... cu. yds.	500	113	22.6
Lining .... cu. yds.	24	6	25
Second-class concrete .... cu. yds.	630	194	30.8
First-class reinforced concrete .... cu. yds.	1,000	490	49
Cast iron pipe .... lbs.	18,200	0	0
Trenching and backfilling for pipe .... lin. ft.	630	40	6.4
Structural steel .... lbs.	43,500	13,066	30
Metal reinforcement .... lbs.	75,100	40,621	54.1
Chipping concrete .... cu. ft.	570	40	7
Chipping edges of machinery recesses .... lin. ft.	2,560	598	23.4
Wash wall .... cu. yds.	100	0	0
Hydraulic equipment, lock No. 27 .... lump sum	$5,500	0	0
Hydraulic equipment, locks No. 28-A and 28-B .. No.	2	0	0
Hydraulic equipment, lock No. 29 .... lump sum	$5,000	0	0

ITEMS OF WORK.	Preliminary estimate.	Work done during year and to date.	Per cent of work done during year and to date.
Hydraulic equipment, lock No. 33........lump sum	$6,500	0	0
Hydraulic equipment, locks Nos. 34-35....lump sum	$7,000	0	0
Traveling cranes............................No.	6	0	0
Lock maintenance accessories.................No.	11	0	0
Gasoline-electric station maintenance accessories lump sum	$700	0	0
Station maintenance accessories, lock No. 27 lump sum	$250	0	0
Station maintenance accessories, locks Nos. 28-A, 28-B, 29, 33 and 34........................No.	5	0	0
Electrical equipment, gasoline-electric power house, lock No. 26.........................lump sum	$9,500	0	0
Electrical equipment, power house, lock No. 27 lump sum	$4,500	0	0
Electrical equipment, power house, locks Nos. 28-A and 28-B............................No.	2	0	0
Electrical equipment, power house, lock No. 29, lump sum	$10,500	0	0
Electrical equipment, power house, lock No. 33 lump sum	$8,500	0	0
Electrical equipment, power house, lock No. 34 lump sum	$8,000	0	0
Electrical equipment, guard-locks..............No.	2	0	0
Equipments for centers of distribution.........No.	2	0	0
Bare copper conductors.......................lbs.	62,400	0	0
Lead-covered, rubber-insulated conductors......lbs.	43,500	0	0
Armored conductors...........................lbs.	65,000	0	0
Trenching and backfilling for conductors.....lin. ft.	16,900	0	0
Fiber duct..............................lin. ft.	3,350	142	4.2
Metal duct..................................lbs.	47,200	2,438	5.2
Drilling 1½-inch holes.....................lin. ft.	560	188	33.6
Drilling 3-inch holes......................lin. ft.	340	391	115
Arc lamps...................................No.	102	0	0
Arc lamp poles..............................No.	103	1	1
Concrete poles, 30 feet long..................No.	195	104	53.3
Concrete poles, 40 ft. long...................No.	4	5	125
Electric capstans...........................No.	19	0	0
7-hp. gate equipments........................No.	40	0	0
7-hp. valve equipments.......................No.	14	0	0
3-hp. valve equipments.......................No.	24	0	0
By-pass valve equipments.....................No.	2	0	0
Telephone system, locks 29-30...........lump sum	$400	0	0
Telephone system, locks 32-33...........lump sum	$275	0	0
Moving hand rails...........................No.	4	0	0
Tile roofing...........................squares	67	23	34.3
Doors, windows, woodwork and hardware, locks Nos. 26, 29, 33, 34..........................No.	4	360	25
Doors, windows, woodwork and hardware, locks Nos. 28-A and 28-B.......................No.	2	360	50
Painting concrete.........................sq. yds.	2,660	0	0
Bronze tablets..............................No.	7	0	0
Gross estimate............................	$433,380.90	$22,346.74	5.2

"*Contract No.* 21.

"This contract provides for excavating the canal prism and constructing guard-lock, highway bridge abutments and all appertaining work between the Genesee river and the east end of contract No. 6, a distance of 2.43 miles. Gordon Edson, Assistant Engineer, is in charge. The contract was let to Lane Brothers Company, of Altavista, Va., on April 7, 1910.

" This contract has been modified by an alteration as follows:

" Alteration No. 1, approved by the Canal Board April 22, 1913, changes construction along sides of prism east of guard-gate; eliminates channeling and dowels at guard-lock; decreases cost and expedites work.

" Prism excavation has been continued by two steam-shovels and attendant trains of 16-yard dump cars and 40-ton locomotives. One shovel worked two months finishing up the earth cut at the west end of the contract. Other than this all excavation was in rock cut, requiring drilling and blasting and generally channeling at prism line, or in lieu thereof, line drilling. This latter method of drilling holes about three feet apart gives a fairly smooth surface that need not be faced with concrete. Material from prism excavation was disposed of on spoil banks. Shovel operations were closed down part of the time during January, February and March, owing to the excessive amount of water in the cut, all water having to be pumped from prism, there being no possible drainage at present. A locomotive crane was used to clear channel benches, handle stone for the crusher, dig drainage ditches, etc.

" The bridge at the B. R. & P. R. R. crossing has been completed and put into service. Abutments for the Chili road bridge (highway) have been built. The guard-lock has been completed, including steel gates and towers, but not including the operating machinery. The legal complications regarding the railroad crossings of the New York Central and Pennsylvania railroads remain unsettled.

"About the middle of August contract work other than pumping was suspended by the contractor of his own accord and all plant in the prism cut was removed and stored, one steam-shovel being shipped from the site. Pumping water from cut was dis continued about September 1, and pumps disconnected. On September 30 water in the prism cut had risen to a depth of about 12 feet above grade.

" By resolution of the Canal Board this contract was canceled as of date September 30, 1913, because of the inability of the State to deliver the site at the above-named bridges to the contractor.

" The following table shows the amounts and percentages of work done during the year and total done to end of fiscal year:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing............lump sum	$250	$75	$200	30	80
Excavation............cu. yds.	2,354,850	293,771	1,761,013	12.5	74.8
Sheeting and bracing............ft. B. M.	16,000	0	450	0	2.8
Channeling............sq. ft.	340,000	43,444	108,117	12.8	31.8
Forming embankment............cu. yds.	100	0	0	0	0
Lining............cu. yds.	560	271	296	48.4	52.9
Sawed lumber............ft. B. M.	3,000	0	0	0	0
Second-class concrete............cu. yds.	6,700	1,654	4,858	24.7	72.5
Dry retaining wall............cu. yds.	3,850	0	0	0	0
Rock spoil protection............cu. yds.	6,370	0	0	0	0
Wash wall............cu. yds.	8,000	0	0	0	0
Cobblestone paving............sq. yds.	400	0	85	0	21.2
Third-class riprap............cu. yds.	100	0	0	0	0
Fourth-class riprap............cu. yds.	95	51	51	53.7	53.7
12-inch vitrified pipe, laid............lin. ft.	27	25	25	92.6	92.6
Structural steel............lbs.	2,400	0	112	0	4.7
Metal reinforcement............lbs.	7,358	1,696	6,283	23	85.4
Iron castings, plain............lbs.	12,600	3,600	3,600	28.6	28.6
Wooden fence............lin. ft.	310	78	78	25.2	25.2
Metal in guard-gates............lbs.	448,000	372,652	372,652	83.2	83.2
Drilling bolt holes in rock............lin. ft.	444	111	111	25	25
Maintaining traffic............lump sum	$2,000	$440	$1,760	22	88
Coffer-dams, pumping, bailing and draining, lump sum	$4,000	$560	$2,840	14	71
Gross estimate............	$1,320,103 68	$185,091 15	$936,150 02	14	70.9

" *Contract No.* 82.

" This contract provides for constructing three new bridge superstructures within the limits of contract No. 21. Gordon Edson, Assistant Engineer, is in charge. The contract was let to the Groton Bridge Company, Groton, N. Y., on December 10, 1910.

" The Scottsville road and Brooks avenue bridges are completed and the bridge at Chili road will be erected shortly, the contractors having notified us of the shipments of steel. No contract work has been done during the past fiscal year.

" The following table shows the amounts and percentages of work done to the end of the fiscal year:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Structural steel............................lbs.	475,000	0	347,471	0	73.2
Sawed lumber, yellow pine or Douglas fir.ft. B. M.	11,000	0	7,876	0	71.6
Wooden pavement......................sq. yds.	1,425	0	1,060	0	74.4
Lattice railing...........................lin. ft.	560	0	521	0	93
Gross estimate..............................	$28,841 50	0	21,326 12	0	73.9

" *Contract No.* 6.

" This contract provided for the excavation of the canal from the New York Central & Hudson River railroad (west end of contract No. 21) to a point near South Greece, a distance of 3.28 miles.

" The contract was let to F. A. Maselli, of Rochester, N. Y., on May 5, 1905, and was completed in September, 1911. The contract price was $1,035,228.05 and the final estimate was $1,033,864.04.

" This contract was modified by alterations as follows:

" Alteration No. 1, approved by the Canal Board November 14, 1906, changes approach of Spier's Road bridge to improve grade.

" Alteration No. 2, approved by the Canal Board December 20, 1906, eliminates abutments for N. Y. C. railroad bridge to avoid interference with traffic.

" Alteration No. 3, approved by the Canal Board July 6, 1907, changes side slopes due to character of rock.

" Alteration No. 4, approved by the Canal Board July 6, 1907, changes spoil banks to suit material encountered.

" Alteration No. 5, approved by the Canal Board February 21, 1908, extends time due to change in plans.

" Alteration No. 6, approved by the Canal Board July 21, 1908, changes construction of retaining walls and Lyell avenue bridge abutments, Station 2630 to Station 2634, to fit conditions developed.

" Alteration No. 7, approved by the Canal Board June 24, 1909, raises embankment and bridge approaches; changes side slopes and provides additional wash wall due to a change in water-level and material encountered.

" *Contract No.* 60.

" This contract provides for the construction of the canal from the west end of contract No. 6 to about one-half mile west of Adams Basin bridge, a distance of 8.53 miles. C. L. Baldwin and P. L. Arnold, Assistant Engineers, have been in charge at different times. The contract was let to the Empire Engineering Corporation, of New York city, September 22, 1909, and was completed about January 1, 1913.

" This contract was modified by alterations as follows:

" Alteration No. 1, approved by the Canal Board January 27, 1909, changes location of Spencerport waste-weir to obtain better construction.

" Alteration No. 2, approved by the Canal Board February 10, 1909, provides retaining wall for dock at Spencerport.

" Alteration No. 3, approved by the Canal Board August 25, 1909, changes approaches to bridge No. 100 to improve conditions; provides dock at Adam's Basin, and extends culvert 53 under N. Y. C. tracks.

" Alteration No. 5, approved by the Canal Board November 23, 1909, provides for rebuilding certain old culverts on account of poor condition.

" Alteration No. 6, approved by the Canal Board December 23, 1909, provides substructure for guard-gate (location not determined when contract was prepared).

"Alteration No. 7, approved by the Canal Board January 6, 1910, provides new culvert under canal at east end of contract to secure proper drainage; improves grade to South Greece bridge.

" Alteration No. 8, approved by the Canal Board November 22, 1910, provides turning basin west of Cromwell's bridge.

" Alteration No. 9, approved by the Canal Board October 11, 1911, improves grade and alignment at north approach of Cromwell's bridge.

"Alteration No. 10, approved by the Canal Board February 6, 1913, eliminates excavation of dike at east end of contract to avoid flooding unfinished work; eliminates embankment at Adam's

Basin on account of life-bridge, and provides for leaving notches in spillways to maintain present water-surface.

"Contract work during the past fiscal year consisted of excavating a small amount in the prism by ladder dredge, trimming banks and bridge approaches to the required levels and slopes, placing a small amount of puddle blanket on bottom and sides of prism east of bridge No. 95, placing stone paving and wash wall in small amounts at various locations and structures, rebuilding a portion of one culvert extension and a general cleaning and trimming up along the entire contract.

"The following table shows the amounts and percentages of work done during the year and the ratio of the final to the preliminary estimates:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done — final estimate.	Per cent of work done during year.	Per cent — final estimate of preliminary estimate.
Coffer-dams, pumping, bailing and draining, mile	8.5	0.25	8.5	2.9	100
Clearing........lump sum	$2,600	0	$2,600	0	100
Grubbing........cu. yds.	47,586	0	38,742	0	81.4
Excavation........cu. yds.	1,242,713	15,254	1,151,943	1.2	92.7
Sheeting and bracing........ft. B. M.	135,000	0	72,347	0	53.6
Channeling........sq. ft.	26,000	0	15,273	0	58.7
First-class embankment........cu. ft.	741,920	36,656	629,958	4.9	84.9
Second-class embankment........cu. ft.	204,096	928	168,282	0.4	82.4
Lining........cu. ft.	26,654	4,294	23,626	16.1	88.6
Puddle........cu. yds.	63,747	502	29,484	0.8	46.3
Sawed lumber........ft. B. M.	41,000	0	38,853	0	94.8
Foundation piles........lin. ft.	19,050	0	5,427	0	28.5
Wooden sheet-piling........ft B. M.	42,000	0	9,372	0	22.3
Second-class concrete........cu. yds.	13,319	0	13,651	0	102.5
Third-class concrete........cu. yds.	3,049	0	2,269	0	74.5
Reinforced concrete........cu. yds.	1,580	0	1,501	0	95
Masonry coping........cu yds.	15	0	12	0	80
Wash wall........cu. yds.	66,161	1,913	66,260	2.9	100.1
Second-class stone paving........sq. yds.	6,755	1,294	5,242	19.2	77.6
Third-class stone paving........sq. yds.	1,860	0	1,805	0	97
Third-class riprap........cu. yds.	559.4	0	466	0	83.3
Fourth-class riprap........cu. yds.	100	0	114	0	114
Cast iron culvert pipe and specials........lbs.	676,250	0	652,242	0	96.5
12-in. vitrified pipe, laid........lin. ft.	*760	0	695	0	91.4
Trenching and backfilling for 12-in. pipe.lin. ft.	20	0	20	0	100
Structural steel........lbs.	817,360	0	811,259	0	99.3
Metal reinforcement........lbs.	101,840	0	91,136	0	89.5
Wooden pavement, 3 inches thick.....sq. yds.	1,330	0	1,304	0	98
Wooden pavement, 4 inches thick.....sq. yds.	650	0	622	0	95.7
Wooden fence........lin. ft.	16,902	2,171	15,930	12.8	94.2
Wrought iron pipe railing........lin. ft.	205	25	163	12.2	79.5
Lattice railing........lin. ft.	410	0	406	0	99
Sluice-gates, 36" x 40"........No.	7	0	7	0	100
Sluice-gates, 33" x 33"........No.	2	0	2	0	100
Repointing old masonry........lin. ft.	*6,000	2,338	3,488	39	58.1
Maintaining navigation........lump sum	$11,000	0	$11,000	0	100
Maintaining highway traffic........lump sum	$3,500	$122 50	$3,500	3.5	100
36-in. vitrified tile, laid........lin. ft.	244	0	239	0	98
Additional bailing and draining.....lump sum	$1,500	0	$1,500	0	100
Gross estimate........	$1,486,358 42	$30,501 29	$1,317,588 09	2.1	88.7

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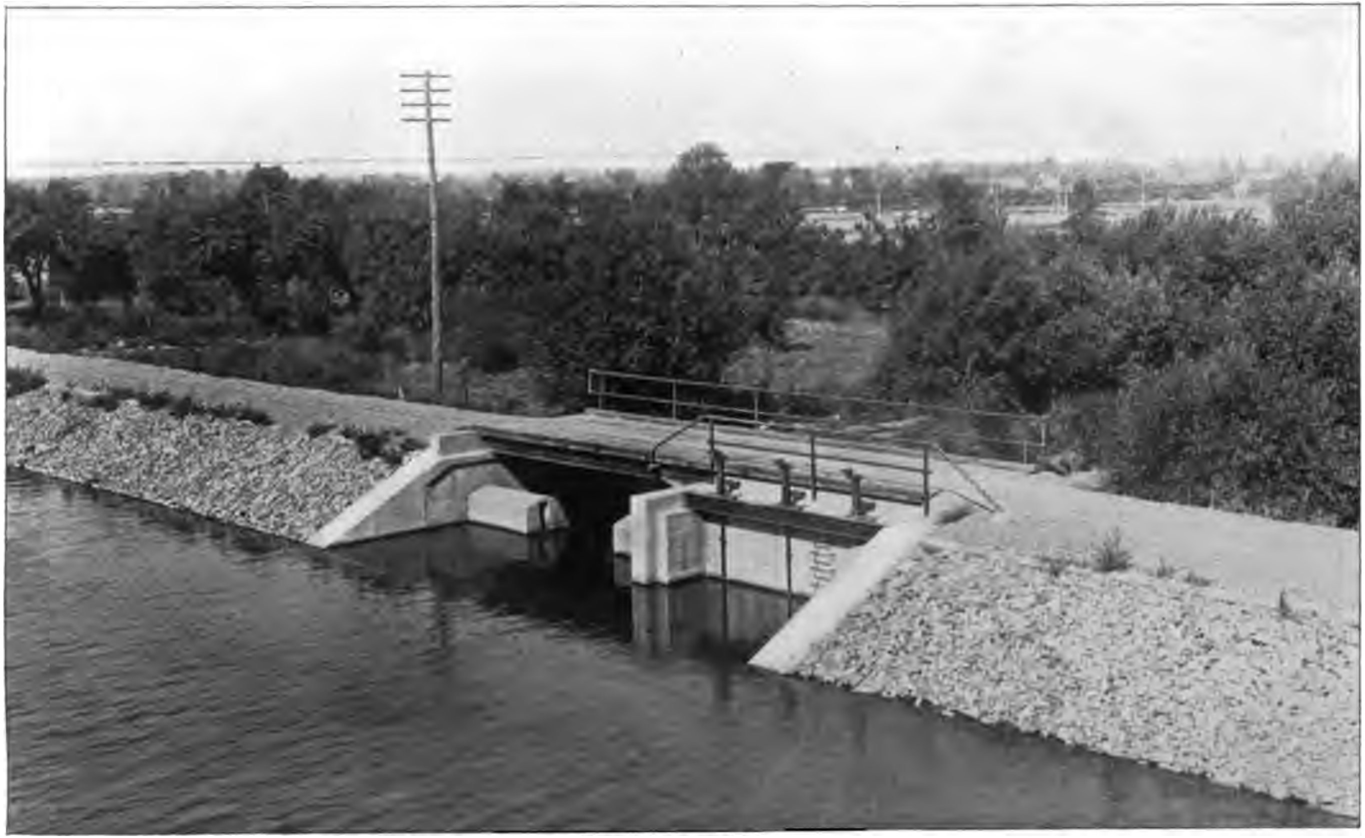
* Includes authorized increase over 15 per cent.



Barge Canal, Contract No. 61.
View of the waste-weir at Brockport.

UNIV. OF MICH.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done — final estimate.	Per cent of work done during year.	Per cent — final estimate of preliminary estimate.
Extra Work Orders.					
Dated Feb. 2, 1909..............unit prices	$5,180 00	....	$4,957 87	......	Finished.
Dated April 26, 1909..............unit prices	1,650 00	....	1,498 00	......	Finished.
Dated Aug. 19, 1909..............unit prices	4,371 00	....	2,946 47	......	Finished.
Dated Oct. 4, 1909.....unit and cost + 15%	578 58	....	634 51	......	Finished.
Dated Jan. 3, 1910.............cost + 15%	1,525 00	....	1,510 76	......	Finished.
Dated Dec. 15, 1910..............unit prices	11,150 40	....	11,150 40	......	Finished.
Dated Mar. 3, 1911.............cost + 15%	3,200 00	....	3,113 09	......	Finished.
Dated April 18, 1911.............cost + 15%	250 00	....	246 79	......	Finished.
Dated Dec. 4, 1911..............unit prices	788 70	....	782 89	......	Finished.
Dated Sept. 30, 1912..............unit prices	366 90	....	338 74	......	Finished.
Dated April 8, 1913.............cost + 15%	....	....	1,162 78	......	Finished.
Total..................................	....	....	$28,342 30	......	......

"*Contract No.* 61.

" This contract provides for the improvement of the canal from the west end of contract No. 60 to the west line of Monroe county, a distance of 7.39 miles. Carl Ashley, C. R. Waters and A. S. Milinowski, Assistant Engineers, have been in charge at different times. The contract was let to Cleveland & Sons Company, of Brockport, N. Y., on October 13, 1908, and was completed during September, 1913. Work on final estimates is now under way.

" This contract has been modified by alterations as follows:

" Alteration No. 3, approved by the Canal Board October 25, 1910, changes plans for certain culverts to insure stable construction; provides substructure for guard-gate (location not determined when contract was prepared); eliminates embankment behind wall at Brockport; provides turning basin west of Brockport; raises sewer manholes to conform to approaches to bridge No. 109.

" Alteration No. 4, approved by the Canal Board July 11, 1912, changes south approach of Smith street bridge to improve railway crossing; provides contract price for Portland cement sidewalks.

" Alteration No. 5, approved by the Canal Board March 19, 1913, provides steel sheet-piling in tow-path bank, Sta. 3691 to Sta. 3708 and Sta. 3656 to Sta. 3689, to prevent leakage.

" From two to three Lidgerwood excavators were operated from October 1, 1912, to February 1, 1913, cleaning up the prism excavation. A small amount of rock excavation was handled by derricks and skips. During the summer a floating derrick with clam-shell bucket handled a small amount of material from the prism, sending it by scow to other locations, where it was used to build up prism embankments.

" The concrete retaining wall for the Clinton street bridge approach has been finished and a considerable amount of concrete sidewalks laid. Paving has been placed at culverts and under bridge slabs and a considerable quantity of lining placed on tow-path. Upwards of 100,000 lin. ft. of 12-inch steel sheet-piling have been driven in tow-path bank to prevent percolation to low ground outside.

" The following table shows the amounts and percentages of work done during the year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining, miles	7.4	1.4	7.4	18.9	100
Clearing........lump sum	$2,400	0	$2,400	0	100
Grubbing........cu. yds.	48,644	0	34,560	0	71
Excavation........cu. yds.	969,573	29,298	811,524	3	83.7
Sheeting and bracing........ft. B. M.	*32,000	0	30,054	0	93.9
Forming embankment, first-class........cu. yds.	566,220	82,296	528,482	14.5	93.3
Forming embankment, second-class........cu. yds.	95,623	1,414	79,751	1.5	83.4
Lining........cu. yds.	18,527	8,228	16,625	44.4	89.7
Puddle........cu. yds.	14,584	0	1,742	0	11.9
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	29,000	0	24,145	0	83.3
Foundation piles........lin. ft.	3,400	0	2,070	0	60.9
Wooden sheet-piling........ft. B. M.	5,000	1,056	4,642	21.1	92.8
Second-class concrete........cu. yds.	11,746	326	10,888	2.8	92.7
Third-class concrete........cu. yds.	1,495	0	1,270	0	85
Reinforced concrete........cu. yds.	355	0	314	0	88.5
Masonry bridge coping........cu. yds.	8	0	6.6	0	82.5
Wash wall........cu. yds.	63,809	5,290	56,165	8.3	88
Second-class stone paving........sq. yds.	498	12	467	2.4	93.8
Third-class stone paving........sq. yds.	1,246	398	933	31.9	74.9
Cobblestone paving........sq. yds.	204	87	87	42.6	42.6
Third-class riprap........cu. yds.	280	0	119	42.5	42.5
Cast iron pipe and specials........lbs.	300,100	0	297,272	99.1	99.1
12-in. vitrified pipe, laid........lin. ft.	418	0	444	106.2	106.2
24-in. vitrified pipe, laid........lin. ft.	110	0	94	85.5	85.5
Structural steel........lbs.	445,015	204	426,201	0.05	95.8
Metal reinforcement........lbs.	45,281	0	38,655	0	85.4
Wooden pavement, 2¼ in. thick........sq. yds.	820	0	792	0	96.6
Wooden pavement, 3¼ in. thick........sq. yds.	220	0	212	0	96.4
Wooden fence........lin. ft.	8,508	0	6,249	0	73.4
Lattice railing........lin. ft.	330	0	310	0	93.9
Sluice gates and hoists........No.	3	0	3	0	100
Relaying board walk........sq. ft.	970	360	360	37.1	37.1
Drilling bolt holes in rock........lin. ft.	1,400	7	551	0.5	39.4
Maintaining navigation........lump sum	$10,000	$1,500	$10,000	15	100
Maintaining highway traffic........lump sum	$2,000	0	$2,000	0	100
Additional bailing and draining........lump sum	$4,000	$1,000	$4,000	25	100
Portland cement sidewalks........sq. ft.	2,100	2,190	2,190	104.3	104.3
Steel sheet-piling........lin. ft.	100,000	100,060	100,060	100.1	100.1
Gross estimate........	*$1,181,453 35	$152,839 86	$1,014,714 86	12.1	85.9

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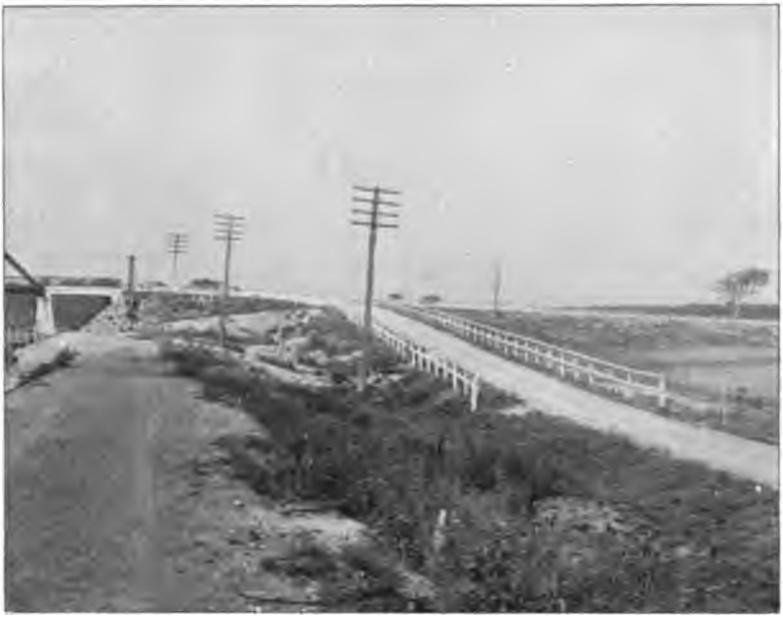
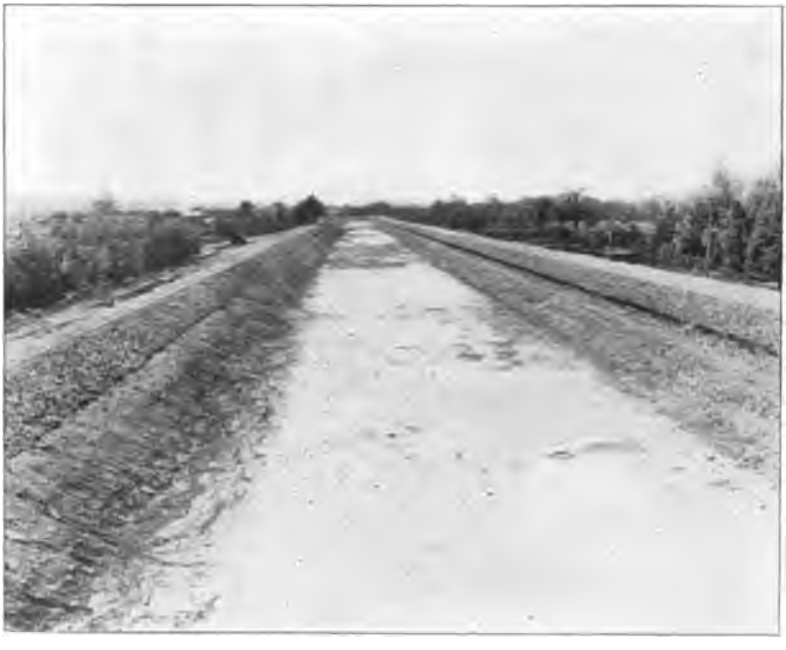
* Includes authorized increase over 15 per cent.



View showing manner of making approaches to new bridge at site of old bridge No. 106.



A section of the finished prism. View west from bridge No. 110.

BARGE CANAL, CONTRACT No. 61.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Extra Work Orders					
Dated Nov. 24, 1909 .... unit prices	$300 00	....	$101 70	......	Finished
Dated Oct. 2, 1912 .... unit prices	$303 00	....	....	......	....
Total	....	....	$101 70	......	....

"*Contract No.* 75.

"This contract provided for the construction of three guard-gate superstructures at the following locations: About 1.3 miles east of Spencerport, and near the west line of Brockport; 1.5 miles east of Middleport. The first two structures are within the limits of Residency No. 9.

"The contract was let to the United Construction Company of Albany, N. Y., on March 1, 1910, and was completed during the winter of 1913.

"The only work done during the past fiscal year consisted of minor changes to the operating machinery and placing of sheet iron hoods over the hoisting machinery proper.

"The following table shows the amounts and percentages of work done during the year and the ratios of the final estimate to the preliminary estimate.

ITEMS OF WORK.	Preliminary estimate.	Work done during year	Total work done—final estimate.	Per cent of work done during year.	Per cent —final estimate to preliminary estimate.
Metal in guard-gate .... lbs.	700,000	255	669,818	0.04	95.7
Second-class concrete .... cu. yds.	97	185	8,685	1.9	89.5
Sawed lumber .... ft. B. M.	*1,550	0	1,395	....	90
Gross estimate	*$42,950	$2,779	$41,027 73	0.06	95.5
Extra work order, dated Aug. 22, 1912. cost + 15%	....	....	$2,814 15	....	Finished.

* Includes authorized increase over 15 per cent.

"*Contract No.* 105.

"This contract provides for the construction of five lift-bridges over the Erie canal and all appertaining construction, at the following locations: Union street, Spencerport; Washington street, Adams Basin; Park avenue, Brockport; Hulburton, Sta. 4091 + 89.67; Gasport, Sta. 5530 + 33. The first three structures are within the limits of Residency No. 9.

" The contract was let to Skene & Richmond, of Louisa, Ky., on April 19, 1912, and the work within this residency was completed in August, 1913.

" This contract has been modified by an alteration as follows:

" Alteration No. 1, approved by the Canal Board May 27, 1913, substitutes Portland cement for gravel walks at Park avenue, Brockport, to conform to local improvement.

" During the past year the bridge at Spencerport was entirely finished, including superstructure and painting same, installing operating machinery, together with grading approaches and cleaning up at Adams Basin. At Brockport one abutment was built, also adjacent retaining walls; superstructure erected, operating machinery installed and approaches graded.

" The following table shows the amounts and percentages of work done on the whole contract during the year and total done to end of fiscal year:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining, lump sum	$3,000	$1,326	$3,000	44.2	100
Excavation.............................cu. yds.	44,000	30,440	35,835	69.2	81.4
Sheeting and bracing....................ft. B. M.	*115,000	47,045	106,900	40.9	92.9
Forming embankment...................cu. yds.	4,000	1,279	1,749	32	43.7
Lining.....................................cu. yds.	1,230	1,123	1,130	91.3	91.9
Sawed lumber, yellow pine...............ft. B. M.	96,000	96,155	96,155	100.2	100.2
Second-class concrete....................cu. yds.	3,200	2,547	2,945	79.6	92
Reinforced concrete.......................cu. yds.	4,400	3,241	4,395	73.7	99.9
Wash wall...................................cu. yds.	500	441	441	88.2	88.2
Cobblestone paving........................cu. yds.	560	244	244	43.6	43.6
Cast iron pipe and specials.....................lbs.	20,000	19,232	19,490	96.2	97.5
Structural steel.....................................lbs.	1,470,000	1,396,726	1,398,543	95	95.1
Machinery...lbs.	200,000	186,095	186,095	93	93
Metal reinforcement...............................lbs.	282,000	174,720	259,738	62	92.1
Portland cement sidewalk......................sq. ft.	4,680	3,350	3,350	71.6	71.6
Brick pavement...................................sq. yds.	230	220	220	95.7	95.7
Wooden fence.......................................lin. ft.	600	446	446	74.3	74.3
Lattice railing.......................................lin. ft.	2,100	2,160	2,160	102.9	102.9
Drilling holes in rock.............................lin. ft.	500	5	12	1	2.4
Electrical equipment..................................No.	5	5	5	100	100
Electrical pump...No.	5	5	5	100	100
Operator's cabin...No.	5	5	5	100	100
Maintaining navigation.....................lump sum	$2,500	$1,738 75	$2,500	69.5	100
Maintaining highway traffic.................lump sum	$3,000	$2,637 50	$3,000	87.9	100
Gross estimate...	*$264,455	$215,858 19	$246,501 85	81.6	93.2

* Includes authorized increase over 15 per cent.

" *Contract No.* 106.

" This contract will provide for the construction of the Main street lift-bridge, Brockport, together with bridges on other residencies. The contract has not yet been awarded.

" *Contract No.* 112.

" This contract provided for driving steel sheet-piling in the embankment of the canal at certain localities within the limits of contracts Nos. 60 and 66.

" The contract was let to John Young, of Syracuse, N. Y., on April 24, 1913, and completed in the early summer of the same year.

" The piling was of the Lackawanna type, about 12 inches wide and of various lengths from 16 to 24 feet, driven as a rule about three feet back of the front angle of the prism and with the tops about one foot below the surface of the ground. Practically all of the piling was driven in the tow-path bank, where the ground surface beyond the canal banks was considerably below the top of the banks, in some cases even below the bottom of the prism, the object of the piling being to form a barrier to the seepage water that for some time past has percolated through the banks, causing damage to adjacent lands and in a few instances leading to small breaks in the banks. The contract price for this steel piling driven was 83 cents per linear foot of pile.

" The following table shows the amounts and percentages of work done on the whole contract and the ratios of final to preliminary estimates:

ITEM OF WORK.	Preliminary estimate.	Work done during year.	Total work done—final estimate.	Per cent of work done during year.	Per cent—final estimate of preliminary estimate.
12-in. steel sheet-piling . . . . lin. ft.	145,000	145,204	145,204	100.1	100.1
Gross estimate	$120,350	$120,519 32	$120,519 32	100.1	100.1

" *Contract No.* 113.

" This contract provides for the furnishing of sawed lumber and round piles at the Bushnell's Basin and Holley concrete troughs. The contract was let to Wm. J. Dowdle, of Oswego, N. Y., April 15, 1913.

" The idea of this contract is to have on hand and available a reasonably large stock of lumber and piles for emergency use at the sites of the concrete troughs.

" The material to be delivered on this residency at Bushnell's Basin is about 90 per cent delivered on the ground, piled and protected from the elements. That at Holley, on contract No. 62, is 99.5 per cent completed.

" The following table shows the amounts and percentages of work done on the whole contract to the end of the fiscal year:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Sawed lumber ....ft. B. M.	425,000	413,053	413,053	97.2	97.2
Wooden piles, 16 ft. long ....No.	510	403	403	79	79
Wooden piles, 24 ft. long ....No.	510	459	459	90	90
Wooden piles, 36 ft. long ....No.	510	476	476	93.3	93.3
Gross estimate	$21,964 00	$20,782 25	$20,782 25	94.6	94.6

Portion of contract within Residency No. 9 about 90 per cent completed.
Portion of contract within Residency No. 10-A about 99.5 per cent completed.

ERIE CANAL, RESIDENCY NO. 10-A.

Resident Engineer, J. V. Hogan reports:

" Residency No. 10-A extends from the east line of Orleans county to 100 feet east of the Main street bridge in Gasport, a distance of 32.05 miles, and includes within its limits contracts Nos. 9, 62, 64 and 65, and portions of contracts Nos. 75, 105, 106 and 113.

" Construction work aggregating $1,530,000 has been completed during the past year. Detailed report of work done on the various contracts within the residency follows:

" *Contract No.* 9.

" This contract, extending 5.68 miles, from 0.16 of a mile east of Eagle Harbor bridge to 0.09 of a mile west of Beal's bridge, has been completed since June, 1912. The Thomas Crimmins Contracting Company, of New York city, were the contractors.

" This contract was modified by alterations as follows:

" Alteration No. 2, approved by the Canal Board October 21, 1908, changes plans of culvert No. 95, to retain present structure, which is in good condition; changes specifications for concrete to secure better mixture.

" Alteration No. 3, approved by the Canal Board December 5, 1908, provides for excavating section not included in original contract, due to change in location of guard-gate.

" Alteration No. 5, approved by the Canal Board August 25, 1909, provides retaining wall at Knowlesville for dock, and retaining wall for approach to Knowlesville bridge to prevent damage to adjacent property.

" Alteration No. 6, approved by the Canal Board January 6, 1910, provides dock wall at Eagle Harbor; also waterproofing at old culverts No. 95 and 96.

" Alteration No. 7, approved by the Canal Board December 23, 1909, provides lift-bridges at Eagle Harbor and Knowlesville to meet local demands.

" Alteration No. 8, approved by the Canal Board February 15, 1910, provides timber tow-paths around bridge abutments to maintain traffic.

" Alteration No. 9, approved by the Canal Board April 14, 1910, provides third-class riprap below wash wall on account of soft material encountered.

" Alteration No. 10, approved by the Canal Board October 25, 1910, provides additional drainage ditches; for removal old stop gate at Knowlesville; extends culvert at Beal's bridge; provides concrete beams to reinforce bridge abutment.

" *Contract No.* 62.

" This contract provides for the improvement of the Erie canal from the east line of Orleans county to 0.16 of a mile east of Eagle Harbor bridge, a distance of 14.15 miles. I. M. Ludington's Sons, of Rochester, are the contractors and the contract was awarded August 11, 1910.

" J. S. Summers, Assistant Engineer, was in charge of the Holley section and A. S. Milinowski, Assistant Engineer, in charge of the Albion section, until January 1. From that time up to the present time J. S. Summers has been in charge of the entire section.

" This contract has been modified by alterations as follows:

" Alteration No. 1, approved by the Canal Board November 16, 1911, changes prism protection and lining at various points to insure against leakage on account of porous material and high embankments.

" Alteration No. 2, approved by the Canal Board December 27, 1911, replaces old wall at Hulberton with concrete wall (old wall in poor condition); extends rubble slope walls at quarry sections near Hulberton.

" Alteration No. 3, approved by the Canal Board February 6, 1913, changes plans of north enbankment of Holley trough to secure greater stability.

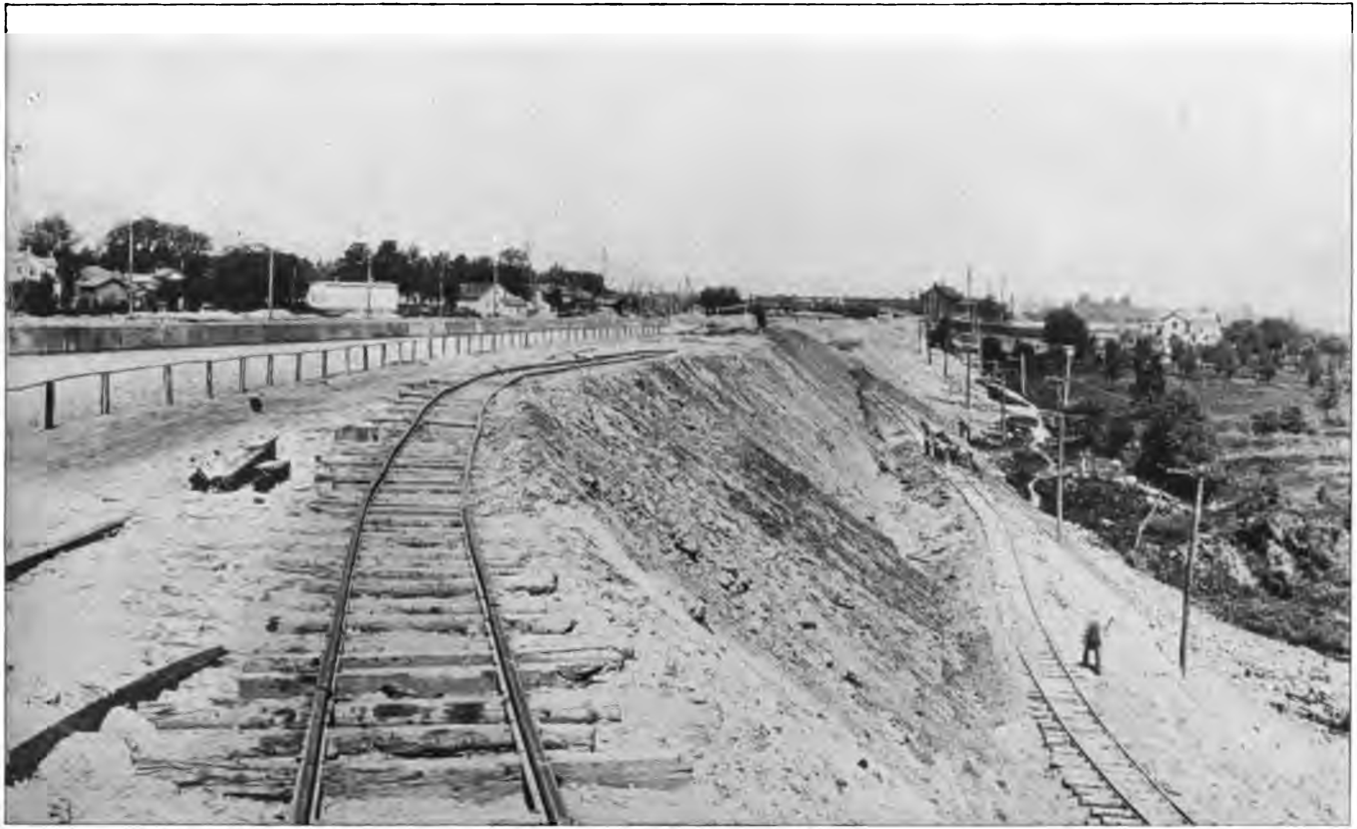
" Alteration No. 4, approved by the Canal Board March 19, 1913, provides rubble walls at various points on account of proximity of quarries and to reduce amount of land appropriated; provides culvert at Station 4291, to avoid flooding land; provides ditch for drainage, and for leaving in place old guard-gates till new ones are completed.

" Alteration No. 5, approved by the Canal Board March 19, 1913, provides concrete slope protection at various points to insure stability of banks.

" Alteration No. 6, approved by the Canal Board May 27, 1913, eliminates piles at Lattin's guard-gate on account of hardpan; provides rubble wall in front of quarry near culvert No. 69 and riprap at culvert No. 69.

" Alteration No. 7, approved by the Canal Board September 30, 1913, changes approaches of Main street bridge, etc., to conform to local street improvements; substitutes wash wall for riprap on outside of bank at culvert No. 65 to decrease expense.

" During the past year this contract has been brought to practically a state of completion. With the exception of a certain amount of lining, bridge paving and wash wall to be placed, certain banks to be trimmed and a small yardage of prism excavation to be removed after the water is drawn from the canal, this contract is ready for final acceptance. A force of men has been at



BARGE CANAL, CONTRACT NO. 62.
Widening the north embankment at the Holley concrete trough.

UNIV. OF MICH.

work since July computing the final estimate on this contract and good progress has been made.

" Construction work aggregating $1,020,000 has been accomplished during the past year, distributed generally over the entire length of the contract. The bulk of the excavation was removed during closed season of navigation in winter of 1912–13, the principal excavation units being a Lidgerwood excavator, three Bucyrus drag-line machines and five steam-shovels, from 60 to 75 tons capacity, with car outfits. The steam-shovels were used to handle rock excavation within prism lines in the vicinities of Hindsburg, Brockville, Hulberton and Holley. During the winter season culverts Nos. 72, 74, 76, 79 and 80 were completed. The work on the Holley and Eagle Harbor troughs was finished, about 12,000 cubic yards of second-class concrete being placed at Holley and 1,400 cubic yards at Eagle Harbor.

" During the season of navigation the major construction operation carried on was the widening of the north bank across the Holley fill, which entailed the placing of some 45,000 cubic yards of material and necessitated the extension of culvert No. 65 some 90 feet and the widening and deepening of Sandy creek from the outlet end of culvert No. 65 for some 1,200 feet. This work is practically completed. During the past year also the Lattin's guard-gate, together with Lattin's and Hindsburg overhead bridges, have been erected and the steel work on Ingersoll street and Holley lift-bridges has been placed. The last named bridges will be placed in operation as lift-bridges very shortly. The Main street, Albion, lift-bridge has been completed and has been in operation during entire season of navigation with satisfactory results. During the year there have also been placed some 16,000 cubic yards of rubble masonry at various walls, 73,000 cubic yards of wash wall, 5,600 square yards of second-class paving at various culverts, 9,300 square yards of third-class paving at various bridges, 16,000 cubic yards of lining on tow-path and bridge approaches, and 224,000 square feet of tar-felt waterproofing placed at the two troughs. This contract has shown a very satisfactory rate of progress, has been pushed vigorously and will be completed by January 1, 1914.

" The following table shows the amount and percentages of work done during the past year and also to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent. of work done to date.
Coffer-dams, pumping, bailing and draining . . miles	14.15	2.75	13.75	19.4	97.2
Clearing . . . lump sum	$7,200	$7,200	$7,200	100	100
Excavation . . . cu. yds.	1,744,285	595,070	1,909,949	34.1	109.5
Sheet and bracing . . . ft. B. M.	160,000	24,120	91,012	15	57
Round timber . . . lin. ft.	2,000	0	466	0	23.3
Channeling . . . sq. ft.	11,960	0	2,600	0	21.8
Forming embankment . . . cu. yds.	755,218	218,694	688,252	29	91.3
Lining . . . cu. yds.	37,868	16,048	16,821	42.4	44.4
Puddle . . . cu. yds.	30,000	2,871	3,494	9.5	11.6
Sawed lumber, yellow pine or Douglas fir . . ft. B. M.	64,000	16,471	40,823	25.6	64
Foundation piles . . . lin. ft.	3,360	0	1,100	0	32.8
Wooden sheet-piling . . . ft. B. M.	46,600	7,494	7,494	16.1	16.1
Second-class concrete . . . cu. yds.	62,455	26,004	63,048	41.6	100.1
Third-class concrete . . . cu. yds.	4,549	833	4,292	18.3	94.5
Reinforced concrete . . . cu. yds.	4,160	1,023	3,869	24.6	93
First-class masonry coping . . . cu. yds.	29	7	25	24.1	86.2
Rubble masonry . . . cu. yds.	25,634	16,798	25,503	65.6	99.7
Dry retaining wall . . . cu. yds.	1,142	0	0	0	0
Wash wall . . . cu. yds.	95,932	73,013	120,853	76.2	126.3
Second-class stone paving . . . sq. yds.	9,050	5,632	6,611	62.1	73.1
Third-class stone paving . . . sq. yds.	14,533	9,307	10,479	64.1	72.3
Cobblestone paving . . . sq. yds.	200	0	0	0	0
Second-class riprap . . . cu. yds.	2,507	1,469	1,469	58.5	58.5
Third-class riprap . . . cu. yds.	71	0	0	0	0
Cast iron culvert pipe and specials . . . lbs.	1,774,400	453,348	1,771,887	25.6	99.8
8-in. vitrified pipe, laid . . . lin. ft.	450	124	124	27.6	27.6
Trenching and backfilling for 8-in. vitrified pipe, lin. ft.	450	150	350	33.3	77.7
Structural steel . . . lbs.	2,402,880	696,152	2,273,044	29	94.7
Metal reinforcement . . . lbs.	575,120	161,811	496,147	28.2	86.3
Iron castings, plain . . . lbs.	19,100	8,540	9,275	44.7	48.5
Expanded metal . . . lbs.	4,130	3,478	4,048	84.3	98.1
Portland cement sidewalk . . . sq. ft.	560	560	560	100	100
Relaying sidewalks . . . sq. yds.	30	0	0	0	0
Brick pavement . . . sq. yds.	120	0	0	0	0
Wooden pavement, 2¾ inches thick . . . sq. yds.	3,224	324	3,440	100	106.5
Wooden pavement, 3¾ inches thick . . . sq. yds.	1,302	784	1,038	60.2	79.7
Wooden fence . . . lin. ft.	13,005	4,169	7,159	32.1	55.1
Wrought iron pipe railing . . . lin. ft.	85	0	82	0	96.5
Lattice railing . . . lin. ft.	1,580	603	603	38.2	38.2
Repointing old masonry . . . lin. ft.	5,400	0	0	0	0
Drilling bolt holes in old masonry . . . lin. ft.	840	100	433	11.9	51.5
Waste-gates, 24 x 24 inches . . . No.	7	3	7	42.8	100
Waste-gates, 36 x 36 inches . . . No.	7	1	7	14.3	100
Metal in guard-gates . . . lbs.	465,000	212,634	419,156	45.8	90.2
Machinery in lift-bridge . . . lbs.	100,000	30,500	36,100	30.5	36.1
Electric equipment for lift-bridges . . . No.	3	1	1	33.3	33.3
Operator's cabin . . . No.	3	1	2½	33.3	83.5
Pumps . . . No.	2	1	1	50	50
Tar-felt waterproof . . . sq. ft.	264,800	223,682	250,947	84.4	94.7
Removing old bridge superstructures . . . lump sum	$600	$450	$600	75	100
Maintaining navigation . . . lump sum	$16,800	$840	$14,280	50	85
Maintaining highway traffic . . . lump sum	$8,400	$7,140	$7,140	85	85
Removing buildings . . . No.	68	17	57	25	84
Sand filling . . . cu. yds.	4,900	4,072	4,638	83	94.6
Additional pumping, bailing and draining . lump sum	$250	0	0	0	0
Gross estimate . . .	$2,661,991	$1,020,920	$2,650,560	38.4	99.6

"*Contract No.* 64.

"This contract provides for the improvement of the Erie canal from a point 600 feet west of Prospect street bridge, Medina, to a point 100 feet east of Gasport bridge. Length, 9.91 miles. Contract was awarded to the Empire Engineering Corporation of New York city, August 6, 1908. Construction work aggregating $226,000 has been estimated during the past year. R. H. Merrill, Assistant Engineer, has been in charge of work on this contract.

"This contract has been modified by alterations as follows:

"Alteration No. 2, approved by the Canal Board August 25, 1909, provides for concrete head wall instead of first-class masonry for culvert No. 103 — old stone in poor condition.

"Alteration No. 3, approved by the Canal Board September 22, 1909, changes position of bridge No. 141 to improve alignment and avoid cutting bank of canal.

"Alteration No. 5, approved by the Canal Board November 23, 1909, provides for rebuilding culverts Nos. 110 and 111 on account of poor condition of old masonry; provides waste-weir at each branch of Johnson's creek, recent investigation showing necessity.

"Alteration No. 6, approved by the Canal Board December 23, 1909, provides substructure for guard-gate to expedite work.

"Alteration No. 7, approved by the Canal Board March 23, 1910, changes Middleport walls to retain old wall and to obtain wider prism; changes south approach of Reynales bridge to allow highway underneath abutment.

"Alteration No. 8, approved by the Canal Board December 29, 1910, extends south wall at Middleport to avoid damage to property; provides culvert, etc., for drainage at Hurd's and Jackson's bridges; improves alignment of Hurd's bridge approaches; changes bridge approaches, etc., on account of adjacent highway changes.

"Alteration No. 9, approved by the Canal Board April 6, 1911, changes Johnson's waste-weir for better foundation.

"Alteration No. 10, approved by the Canal Board August 30, 1911, provides guard-gate substructure just east of Gasport on account of change of location from adjacent contract.

"Alteration No. 11, approved by the Canal Board March 19, 1913, provides concrete slope protection for tow-path bank, Station 5485 to Station 5488, to insure stability.

" Practically all of the construction work has been done during the season of navigation. During the winter efforts of the contractors were directed toward trimming banks, shaping prism to neat lines and overhauling their equipment for work during the summer, as all the structures on this contract have been completed for some time. The bulk of work done has consisted of excavation, forming of embankment and the placing of lining and wash wall. The excavation has been made by means of two dipper dredges, the dredge *Empire,* the larger of the two, having a 70-foot boom and 60-foot dipper handle, operating a four-cubic yard bucket, and the smaller dredge, the *Peconic,* having a 50-foot boom with a 50-foot dipper handle, operating a three-cubic yard bucket. These dredges worked during the past season between Middleport and Medina and have practically completed prism excavation. The contractors have also operated a fleet of tugs and scows, together with three derrick boats, in the placing of wash wall and lining. About 18,000 cubic yards of wash wall and 4,600 yards of lining were placed. A small amount of stone paving and wooden fence also was built. This contract has shown a satisfactory rate of progress and with the exception of some winter work in the vicinity of culvert No. 102 prism work is completed, some 270,000 cubic yards of excavation having been accomplished during the past year.

" The following table shows the amounts and percentages of work done during the year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining . . miles	10	0	6	0	60
Clearing . . . . lump sum	$2,600	$390	$2,600	15	100
Grubbing . . . . cu. yds.	54,982	13,883	49,446	25.3	90
Excavation . . . . cu. yds.	1,138,681	270,234	887,023	23.8	78
Forming embankment, first-class . . . . cu. yds.	413,731	45,328	293,621	10.9	71
Forming embankment, second-class . . . . cu. yds.	121,060	5,135	110,294	4.2	91.2
Lining . . . . cu. yds.	26,034	4,609	8,852	17.7	34
Puddle . . . . cu. yds.	4,517	18	1,573	0.4	34.9
Sawed lumber, yellow pine or Douglas fir . ft. B. M.	60,500	15,296	38,104	25.2	63.1
Foundation piles . . . . lin. ft.	3,500	0	2,300	0	65.7
Wooden sheet-piling . . . . ft. B. M.	134,000	0	36,456	0	26.4
Second-class concrete . . . . cu. yds.	17,631	266	16,020	1.4	90.8
Third-class concrete . . . . cu. yds.	3,201	0	2,702	0	84.5
Reinforced concrete . . . . cu. yds.	728	0	659	0	90.5
First-class masonry . . . . cu. yds.	64	0	48	0	75
First-class masonry backing . . . . cu. yds.	0	0	0	0	0
First-class masonry bridge coping . . . . cu. yds.	50	2	11	4	22
Wash wall . . . . cu. yds.	69,702	17,854	51,105	25.6	73.4
Second-class stone paving . . . . sq. yds.	2,160	179	496	8.3	23

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Third-class stone paving .... sq. yds.	2,800	322	1,607	11.5	57.5
Third-class riprap .... cu. yds.	420	0	202	0	48.2
Cast iron pipe and specials .... lbs.	1,109,805	0	1,121,631	0	100.1
Structural steel .... lbs.	257,360	341	944,288	0.035	98.5
Metal reinforcement .... lbs.	67,000	0	61,647	0	92.2
Wood pavement .... sq. yds.	2,600	0	2,311	0	88.9
Wooden fence .... lin. ft.	13,248	2,420	9,424	18.2	71.2
Sluice-gate valves .... No.	7	0	7	0	100
Relaying old masonry .... cu. yds.	180	0	17	0	9.5
Repointing old masonry .... lin. ft.	1,500	0	0	0	0
Maintaining navigation .... lump sum	$13,000	0	$11,050	0	85.1
Maintaining highway traffic .... lump sum	$4,500	0	$3,375	0	75
Additional bailing and draining .... lump sum	$500	0	$500	0	100
6-inch vitrified pipe laid .... lin. ft.	91.8	0	260	0	283
Additional bailing and draining .... lump sum	$140	0	$140	0	100
Gross estimate	$1,339,265	$226,000	$1,053,740	16.9	78.8

"*Contract No.* 65.

"Contract No. 65 provides for the improvement of the Erie canal from the west end of contract No. 9 to the east end of contract No. 64. Length, 2.31 miles. The contract was awarded March 26, 1913, to the Maryland Dredging and Contracting Company of Baltimore. A. S. Whitbeck, Assistant Engineer, has been in charge of this work.

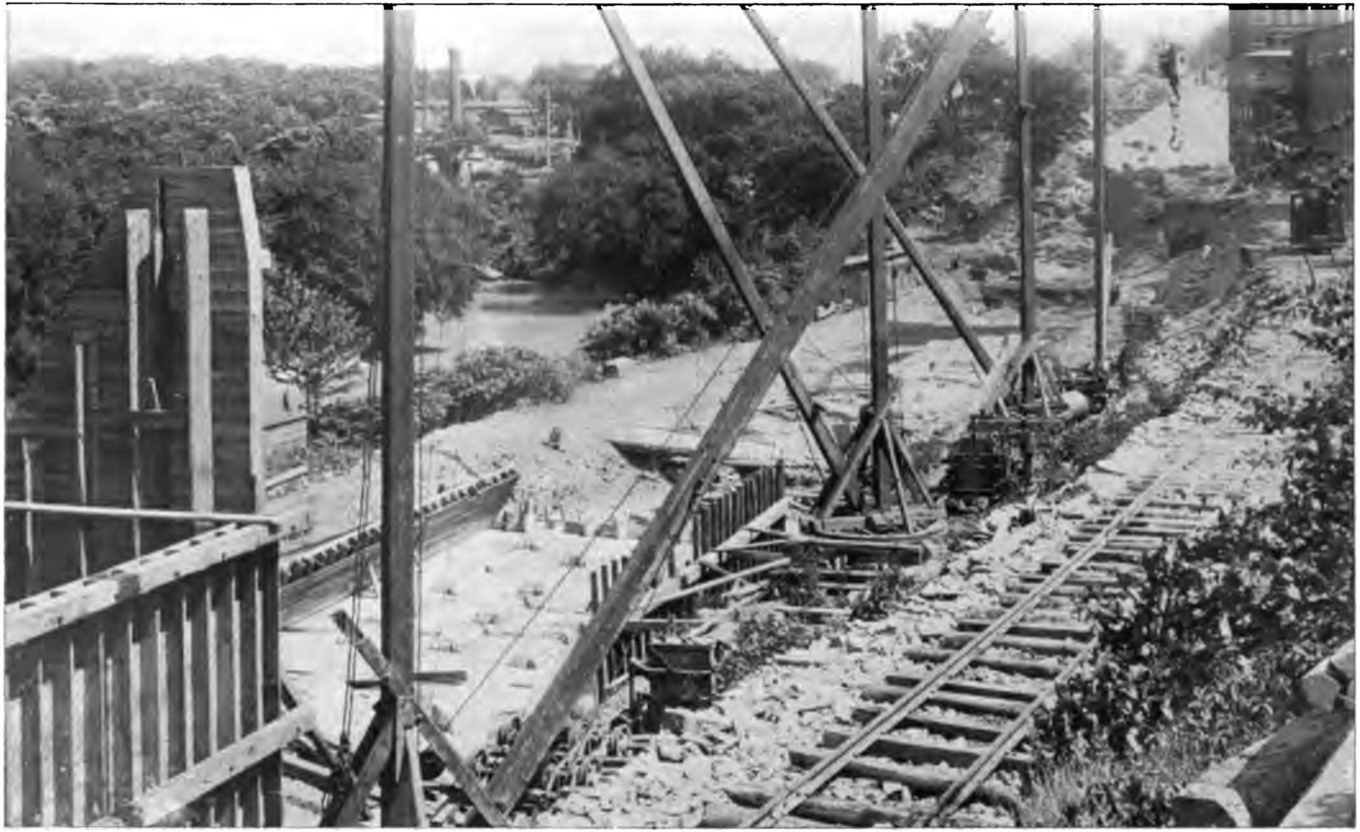
"Construction work to the amount of $226,000 has been estimated up to October 1. The contractors arrived on the ground during the month of April and occupied themselves erecting plant and storing materials until the middle of June, when active work was commenced. A Bucyrus drag-line machine was installed at Hastings bridge and worked east to the end of the contract, widening the canal on the berme side. A Marion 75-ton shovel and car outfit was started from Hastings bridge and worked west to the aqueduct, excavating all material above present water level on the berme side and carrying it to a spoil bank provided at the east end of the contract. A 60-ton Marion shovel started operations on the tow-path side and has been excavating to grade north of the present tow-path between Prospect avenue and Main street bridges and depositing material in Hanlon's spoil bank. These excavating units, together with a hand gang excavating for foundation of gravity wall north of tow-path, removed 113,000 cubic yards of excavation up to October 1.

" The concrete operations on this contract have been confined to the construction of the gravity section wall north of the tow-path through the village of Medina. Arrangements were made for the use of Niagara river gravel on this section and with that end in view a 1½-cubic yard Haynes mixer was installed with a gravity bin of 300 yards capacity. Two locomotive and car outfits are used to carry concrete from the mixer. One-yard Steubner buckets are used and concrete is placed in forms by means of a battery of nine guy derricks, these derricks being each equipped with hoist engines and necessary boilers. To October 1, 21,000 cubic yards of concrete had been placed. The contractors on this work have a well-equipped plant, are active in their construction operations and give every evidence of pushing their work to a satisfactory completion.

" Due to the character of rock encountered in foundations for the gravity wall and acting upon the advice of the Board of Consulting Engineers, the form of footing has been radically changed, with satisfactory results.

" The following table shows the amount of work done during the year.

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining, lump sum	$1,000	$500	$500	50	50
Excavation . . . . cu. yds.	515,000	113,225	113,225	21.9	21.9
Sheeting and bracing . . . . ft. B. M.	15,000	0	0	0	0
Forming embankment . . . . cu. yds.	13,400	0	0	0	0
Lining . . . . cu. yds.	7,950	0	0	0	0
Puddle . . . . cu. yds.	100	0	0	0	0
Sawed lumber, yellow pine . . . . ft. B. M.	24,000	0	0	0	0
Second-class concrete . . . . cu. yds.	69,000	20,921	20,921	30.3	30.3
Third-class concrete . . . . cu. yds.	250	0	0	0	0
Reinforced concrete . . . . cu. yds.	2,000	0	0	0	0
Rubble masonry . . . . cu. yds.	640	0	0	0	0
Wash wall . . . . cu. yds.	12,600	0	0	0	0
Second-class stone paving . . . . sq. yds.	44	0	0	0	0
Third-class stone paving . . . . sq. yds.	3,190	0	0	0	0
Cobblestone paving . . . . sq. yds.	1,080	0	0	0	0
Cast iron pipe and specials . . . . lbs.	137,000	0	0	0	0
Structural steel . . . . lbs.	1,357,150	25,654	25,654	1.9	1.9
Metal reinforcement . . . . lbs.	74,090	3,472	3,472	4.7	4.7
Iron castings, plain . . . . lbs.	1,320	0	0	0	0
Wooden fence . . . . lin. ft.	5,242	0	0	0	0



BARGE CANAL, CONTRACT NO. 65.
View looking east along the site and the beginning of the high retaining wall which separates the new canal prism from Oak Orchard creek gorge at Medina.

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ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Wrought iron pipe railing............lin. ft.	1,400	0	0	0	0
Lattice railing........................lin. ft.	760	0	0	0	0
Drilling bolt holes in old masonry......lin. ft.	1,470	0	0	0	0
Sluice-gates............................No.	3	0	0	0	0
Metal in guard-gates...................lbs.	235,000	0	0	0	0
Waterproofing.........................sq. ft.	12,600	0	0	0	0
Bituminous wearing surface..........sq. yds.	1,100	0	0	0	0
Maintaining navigation............lump sum	$1,000	0	0	0	0
Maintaining highway traffic........lump sum	$500	0	0	0	0
Removing buildings....................No.	38	3	3	7.9	7.9
Gross estimate............................	$1,000,098	$226,810	$226,810	22.7	22.7

"*Contract No.* 75.

"This contract provides for the erection of three guard-gate superstructures, one of which occurs on this residency, 1½ miles east of Middleport. The contractors are the United Construction Company of Albany, and Mr. Merrill, Assistant Engineer, has been in charge of this contract.

"This guard-gate has been put in operation during the past year and certain changes in the operating machinery have been made under an extra work order. Final estimates have been prepared and signed, covering both the original contract and the extra work order and the gate has been accepted as finished.

"The table of work done during the year is attached to the report of Residency No. 9.

"*Contract No.* 105.

"This contract provides for the construction of five lift-bridges, one of which is located at Hulberton on this residency. The contractors are Skene & Richmond, of Louisa, Ky., and J. S. Summers, Assistant Engineer, has charge of this work.

"Estimates aggregating $42,800 have been certified to during the year. The abutments were constructed during the winter of 1912–13 and steel work was erected at the high position and the bridge used as an overhead bridge in order to accommodate highway traffic during the early portion of the season of navigation. During the early summer machinery was installed, transmission line was constructed to the bridge and the bridge placed in operation. This contract is completed as far as this residency is concerned, except that a leak has developed in the drain connecting the pits, which will have to be repaired after water is drained from the canal. The contractors have shown satisfactory progress on this structure and have accomplished the construction of this bridge without any interference to the heavy highway traffic at this point.

" The table of work done during the year is attached to the report of Residency No. 9. An alteration is also noted in this report.

" *Contract No.* 106.

" This contract provides for four lift-bridges, two of which are located on this residency, one at Prospect street, Medina, and the other at Main street, Middleport, and one guard-gate superstructure within the limits of the residency, near Gasport. The contract has not as yet been awarded, but plans are practically completed and are awaiting action of the Canal Board.

" *Contract No.* 113.

" This contract was awarded to Wm. J. Dowdle, of Oswego, April 15, 1913, and covered the furnishing and delivering of a certain amount of lumber and wooden piles at Bushnell's Basin and Holley. J. S. Summers, Assistant Engineer, is in charge of the work.

"A location at Holley, convenient to both railway and canal, was arranged for the contractor and during the early part of the summer some 212,000 ft. B. M. of sawed lumber was piled up, and 759 wooden piles from 16 to 36 feet long have been stored. The piles of sawed lumber have been covered with tar-felt and the ends painted. Final estimates covering this contract are now being prepared.

" The table of work done is attached to the report of Residency No. 9.

" *State Board of Claims.*

" During the past year the State Board of Claims has from time to time asked for reports on certain claims presented to them for adjustment and these have been made in the residency office. In connection with certain of these claims which have to do with the appropriation of quarry lands they have requested that cores be procured, and during the past summer a Calyx drill outfit, under the supervision of a foreman of borings, has been employed in procuring these cores.

" *General Work.*

" During the year some forty-one appropriation surveys have been run, acreage computed and maps made. About 14 miles of final prism sections were taken and several small investigations were made concerning conditions encountered in construction operations."

ERIE CANAL, RESIDENCY NO. 10-B.

Resident Engineer George C. Andrews reports:

" This residency extends from a point about 100 feet east of Gasport bridge westward to the Sulphur Springs guard-lock, a distance of 11.7 miles.

" During the year construction work has been done under contracts Nos. 66, 105, 112, 67, 94 and 40, which cover all the work to be done on this residency, with the exception of two lift-bridges at Lockport.

" The present condition of the work on the residency is as follows:

CONTRACT NUMBER.	Preliminary estimate.	Work done to Sept. 30, 1913.	Work done from Oct. 1, 1912, to Sept. 30, 1913.
*66	$852,805 00	$773,890 00	$9,650 00
*105	44,050 00	41,680 00	40,800 00
*112	33,200 00	31,280 00	31,280 00
67	1,208,110 00	1,001,200 00	261,760 00
94	73,158 00	3,780 00	3,780 00
*40	2,237,256 00	2,086,100 00	347,570 00
	$4,448,579 00	$4,937,930 00	$694,840 00

* Contract completed.

" A detailed description of the contracts follows:

" *Contract No.* 105.

" This contract calls for the construction of five lift-bridges over the Erie canal, one of which is on this residency, at Gasport.

R. C. Georger, Assistant Engineer, is in charge. The contract was let April 19, 1912, to Messrs. Skene & Richmond, of Louisa, Ky.

" The contractors completed the north and south abutments during the winter, erected the steel and installed the machinery in the spring, getting the bridge in operation in time for navigation. The bridge has a vertical lift, the weight of the superstructure being balanced by concrete counterweights and is operated by electric motors. It has been in operation for several months and is proving satisfactory in every respect.

" The table giving the amount of work done on the whole contract is included in the report of Residency No. 9, as is also the mention of an alteration.

" *Contract No.* 66.

" This is the most westerly contract on the 'sixty-mile level' and extends from a point 100 feet east of Gasport bridge to a point about 600 feet east of the Lockport locks, a distance of 6.35 miles. R. C. Georger, Assistant Engineer, is in charge.

" The contract was awarded on September 22, 1908, to the Empire Engineering Corporation, of New York city.

" This contract has been modified by alterations as follows:

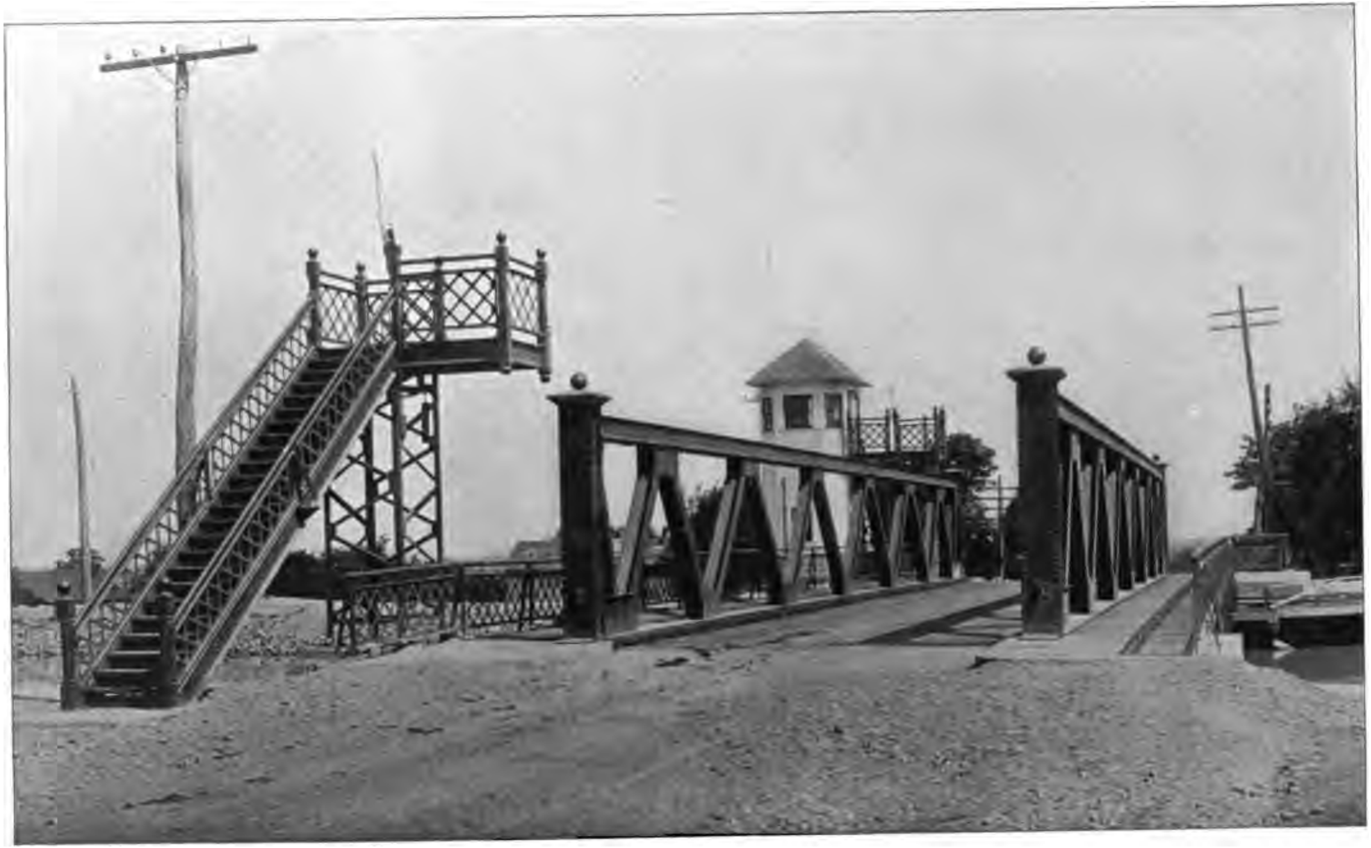
" Alteration No. 1, approved by the Canal Board February 24, 1909, changes location of retaining wall on south side at west end of contract, due to poor foundations.

" Alteration No. 3, approved by the Canal Board November 17, 1909, provides dock at lower town Lockport; provides openings in retaining wall for entrance to dry docks and for strengthening culvert No. 125.

" Alteration No. 4, approved by the Canal Board December 1, 1909, rebuilds culverts Nos. 119 and 121 and new floor in culvert No. 120 on account of poor condition of old structures.

" Alteration No. 5, approved by the Canal Board June 25, 1910, provides turning basin between bridge No. 155 and culvert No. 123; changes side slopes, Station 5782 to Station 5797, on account of soft material, and lengthens Culvert 123.

" Alteration No. 6, approved by the Canal Board October 11, 1911, changes plan of south approach of Lake avenue bridge to avoid damage to property.



Barge Canal, Contract No. 105.
Completed lift-bridge at Gasport.

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"Alteration No. 7, approved by the Canal Board March 11, 1912, provides steel sheet-piling on north bank from Chapel street 1,800 feet easterly.

"Alteration No. 8, approved by the Canal Board February 6, 1913, eliminates Gasport bridge on account of bridge contract; provides for leaving notch in waste-weir to maintain present water-surface.

"The final excavation and trimming of slopes was completed in the fall of 1912 and the contract was completed in December, 1912.

"The following table shows the work accomplished during the year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date
Coffer-dams, pumping, bailing and draining....miles	6.35	0.311	6.223	4.9	98
Clearing....lump sum	$1,900	0	$1,900	0	100
Grubbing....cu. yds.	30,860	0	20,999	0	68
Excavation....cu. yds.	665,492	17,429	631,134	2.6	94.9
Sheeting and bracing....ft. B. M.	148,000	0	59,501	0	40.2
Forming embankment....cu. yds.	287,072	2,466	187,784	0.9	65.4
Forming second-class embankment....cu. yds.	63,200	0	63,559	0	100.5
Lining....cu. yds.	17,184	11	14,837	0.1	86.3
Puddle....cu. yds.	8,374	0	11,884	0	141.9
Sawed lumber, yellow pine....ft. B. M.	18,000	0	17,850	0	100
Foundation piles....lin. ft.	3,830	0	3,522	0	92
Second-class concrete....cu. yds.	14,943	0	14,631	0	98
Third-class concrete....cu. yds.	2,058	0	1,814	0	88.3
Reinforced concrete....cu. yds.	561	0	524	0	93.5
First-class masonry bridge coping....cu. yds.	10	0	8.67	0	86.7
Wash wall....cu. yds.	52,429	0	37,899	0	71.9
Second-class stone paving....sq. yds.	685	67	761	9.8	111.1
Third-class stone paving....sq. yds.	1,432	0	1,533	0	106.9
Third-class riprap....cu. yds.	500	0	331	0	66.2
Cast iron culvert pipe and specials....lbs.	452,360	0	414,154	0	91.5
Structural steel....lbs.	683,600	0	664,250	0	97.2
Metal reinforcement....lbs.	55,900	0	46,676	0	83.5
Wood pavement, 4 in. thick....sq. yds.	340	0	333	0	98
Wood pavement, 3 in. thick....sq. yds.	1,200	0	1,155	0	96.2
Wood fence....lin. ft.	8,640	112	7,289	1.3	84.4
Wrought iron pipe railing....lin. ft.	30	0	26	0	86.7
Lattice railing....lin. ft.	640	0	632	0	98.8
Sluice-gate valves....No.	3	0	3	0	100
Drilling bolt-holes in masonry....lin. ft.	650	0	746	0	114.8
Maintaining navigation....lump sum	$8,250	$569 25	$8,250	7	100
Maintaining highway traffic....lump sum	$3,000	$207	$3,000	7	100
Additional pumping, bailing and draining..lump sum	$750	0	$750	0	100
Steel sheet-piling, 16 ft. long....per pile	1,800	0	2,049	0	113.8
Deduct for sheeting and bracing used second time, ft. B. M.	....	....	3,194	......	....
Gross estimate....	$852,805	$9,654	$773,890	1.1	90.7
Extra Work Orders.					
Dated Jan. 30, 1909....unit prices	$382 80	....	$382 80	......	Finished.
Dated Feb. 24, 1909....unit prices	1,200 00	....	989 70	......	Finished.
Dated Sept. 2, 1909....unit prices	2,788 70	....	2,788 70	......	Finished.
Dated Aug. 7, 1911....unit prices	123 00	....	122 40	......	Finished.
Dated June 7, 1911....unit prices	103 00	....	101 97	......	Finished.
Dated Aug. 17, 1912....unit prices	1,094 63	....	1,013 41	......	Finished.

"*Contract No.* 112.

"This contract calls for driving steel sheet-piling in the embankment of the canal at certain localities within the limits of contracts Nos. 60 and 66, and was awarded on April 24, 1913, to John Young, of Syracuse, N. Y. R. C. Georger, Assistant Engineer, is in charge.

"Work was started immediately after the contract was let and 20-foot piles were driven in the embankment on the tow-path side, between Stas. 5715 and 5727 + 47, Stas. 5744 + 05 and 5747 + 80, and Stas. 5750 + 90 and 5755 + 12. Work was completed on May 26, 1913.

"The table giving the amount done on the whole contract is included in the report of Residency No. 9.

"*Contract No.* 67.

"This contract provides for the construction of the canal prism, with two locks and other structures at Lockport, extending from the west end of contract No. 66 to the east end of contract No. 40, a distance of 0.57 mile. Edward Anderberg, Assistant Engineer, is in charge.

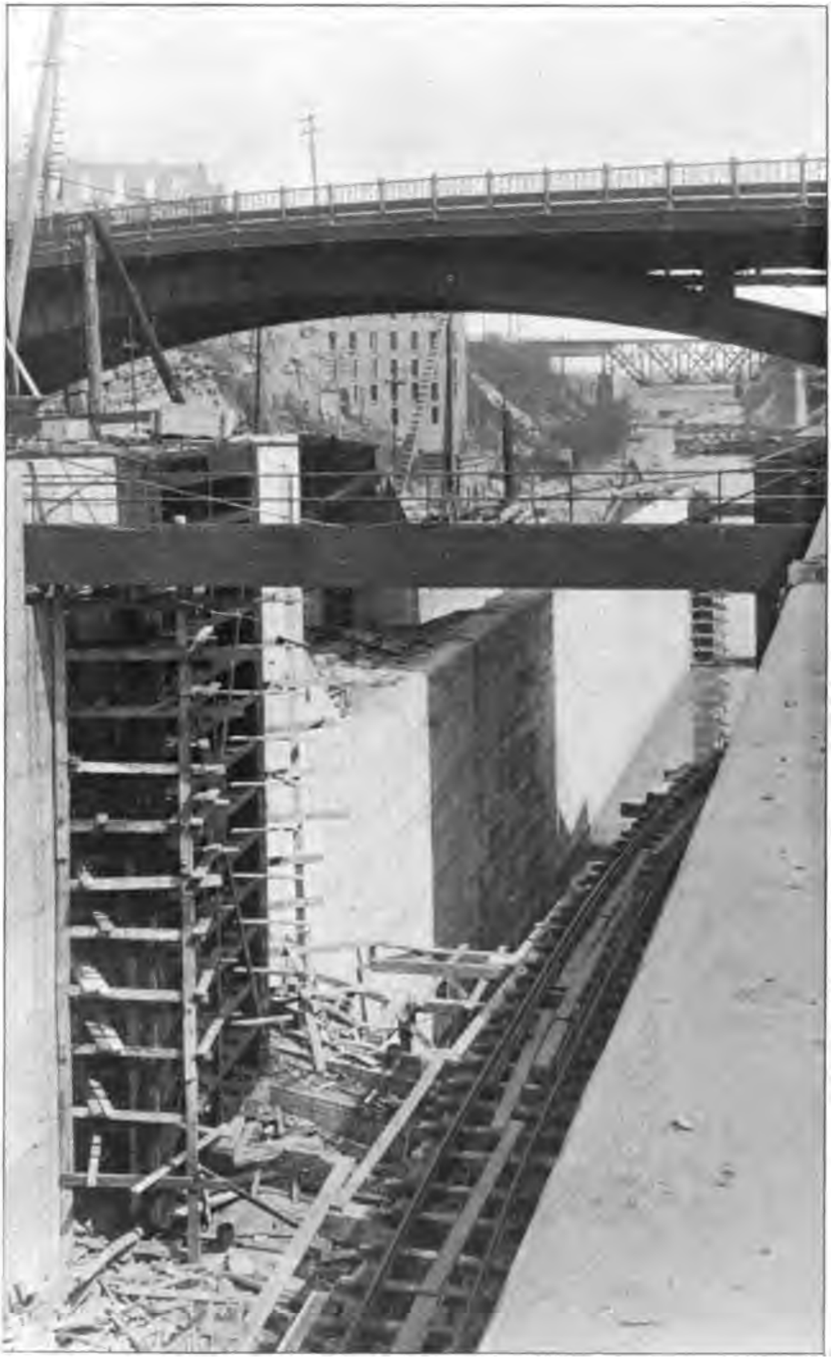
"The contract was awarded to Larkin & Sangster on September 3, 1910, at the contract price of $1,149,401.25, and work was started on October 3, 1910.

"This contract has been modified by alterations as follows:

"Alteration No. 1, approved by the Canal Board July 30, 1912, extends Main street bridge to west of Saxton street to take care of traffic.

"Alteration No. 2, approved by the Canal Board April 22, 1913, provides concrete floor at lock No. 35 on account of poor rock; provides concrete wall across forebay on account of poor rock; eliminates lowering miter-sill of lock No. 71 as unnecessary; eliminates channeling and facing of wall to expedite work and decrease cost.

"During the year the prism excavation has been completed, all the concrete placed and with the exception of the Main street bridge and approaches and cleaning up, all the work is practically finished.



BARGE CANAL, CONTRACT NO. 67.
Erecting the middle gates at locks Nos. 34 and 35, at Lockport.

"The following table shows the amount of work done during the year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.......lump sum	$50	$50	$50	100	100
Excavation.......cu. yds.	262,200	46,712	246,388	17.8	94.3
Tunnel excavation.......cu. yds.	6,700	82	6,110	1.2	91.2
Sheeting and bracing.......ft. B. M.	48,000	1,170	13,748	2.4	28.6
Channeling.......sq. ft.	43,300	1,138	43,248	0.7	27
Forming embankment.......cu. yds.	1,200	0	19	0	1.6
Lining.......cu. yds.	450	206	206	45.7	45.7
Sawed lumber.......ft. B. M.	9,500	4,686	12,983	49.4	136.6
White oak lumber in lock-gates.......ft. B. M.	18,000	13,204	17,204	73.3	95.5
Creosoted lumber.......ft. B. M.	285,000	107,447	185,232	37.6	65
Round timber bracing.......lin. ft.	3,000	94	397	3.1	13.2
Second-class concrete.......cu. yds.	61,550	11,359	50,906	18.4	82.9
Tunnel lining.......cu. yds.	2,900	268	289	9.3	10
Reinforced concrete.......cu. yds.	427	0	364	0	85.4
First-class masonry coping.......cu. yds.	65	24	35	37	53.9
Grouted riprap.......cu. yds.	800	205	230	25.6	28.7
Fourth-class riprap.......cu. yds.	700	342	372	48.8	53.1
6-in. vitrified pipe, laid.......lin. ft.	410	381	446	93	108.8
12-in. vitrified pipe, laid.......lin. ft.	900	330	956	36.7	106.3
15-in. vitrified pipe, laid.......lin. ft.	900	11	843	1.3	93.7
Metal reinforcement.......lbs.	189,945	9,023	140,808	4.7	74.2
Structural steel.......lbs.	4,380,120	1,345,416	3,547,603	30.7	81
Iron castings, plain.......lbs.	193,800	49,224	214,175	25.2	110.5
Iron castings, machined.......lbs.	38,200	5,585	37,750	14.7	98.9
Metal in lock-gates.......lbs.	620,000	404,801	587,561	65.3	94.8
Metal in lock-valves.......lbs.	88,500	55,961	81,991	65.1	92.5
Metal in buffer-beams.......lbs.	103,000	60,951	98,723	59.1	95.8
Wood block pavement.......sq. yds.	6,500	2,579	4,173	39.7	64.2
Drilling bolt holes in rock.......lin. ft.	6,843	1,267	4,080	18.5	59.7
Wrought iron pipe railing.......lin. ft.	1,200	0	468	0	3.9
Lattice railing.......lin. ft.	535	52	499	9.7	93.2
Fiber ducts.......lin. ft.	4,000	924	2,483	23.1	62.1
Gate hoists.......No.	6	0	4	0	66.7
48-inch valves.......No.	3	0	3	0	100
Maintaining highway traffic.......lump sum	$2,750	$825	$2,585	30	94
Maintaining electric railway traffic.......lump sum	$600	$180	$564	30	94
Maintaining navigation.......lump sum	$4,000	$1,400	$3,960	35	99
Removing buildings.......No.	20	2	20	10	100
Storehouse.......lump sum	$850	$212.50	$212.50	25	25
Replacing brick pavement.......sq. yds.	1,760	89.5	143	5	8.2
Coffer-dams, pumping, bailing and draining lump sum	$16,500	$5,940	$16,500	36	100
Temporary coffer-dam across flume forebay lump sum	$625	$625	$625	100	100
Gross estimate.......	$1,181,728	$261,760	$1,001,200	22.1	84.6
Extra Work Orders.					
Dated Feb. 28, 1911.......lump sum	$8,500	....	$8,500	......	Finished.
Dated July 14, 1911.......cost + 15%	....	....	$73 34	......	Finished.
Dated March 5, 1912.......cost + 15%	....	....	$1,257 94	......	Finished.
Dated April 9, 1912.......unit prices	$608 55	....	$648 25	......	Finished.
Dated May 24, 1912.......unit prices	$817	....	$587 94	......	Finished.
Dated Oct. 9, 1912.......unit prices	$4,389 80	....	$4,386 97	......	Finished.

" *Contract No.* 94.

" This contract provides for the power plants, electrical equipment and machinery for operating and lighting the locks on the Western Division and was awarded to MacArthur Brothers Co. and Lord Electric Co., of New York city, on February 17, 1913. Edward Anderberg, Assistant Engineer, is in charge.

" Work was started at locks Nos. 34 and 35 in August, and to date the concrete power house has been built at lock No. 34 and chipping and drilling of concrete completed for both locks.

" The table giving the amount of work done on the whole contract is included in the report of Residency No. 9.

" *Contract No.* 40.

" This contract extends from the west end of contract No. 67, in the city of Lockport, to Sulphur Springs guard-lock at Pendleton, where it adjoins contract No. 19. Length of contract, 4.84 miles. W. T. Huber and R. C. Georger, Assistant Engineers, have been in charge at various times.

" The contract has been under construction by the United Engineering and Contracting Company, of New York city, since March, 1909. The contract price was $2,168,298, but this has been increased by alterations to $2,237,256.

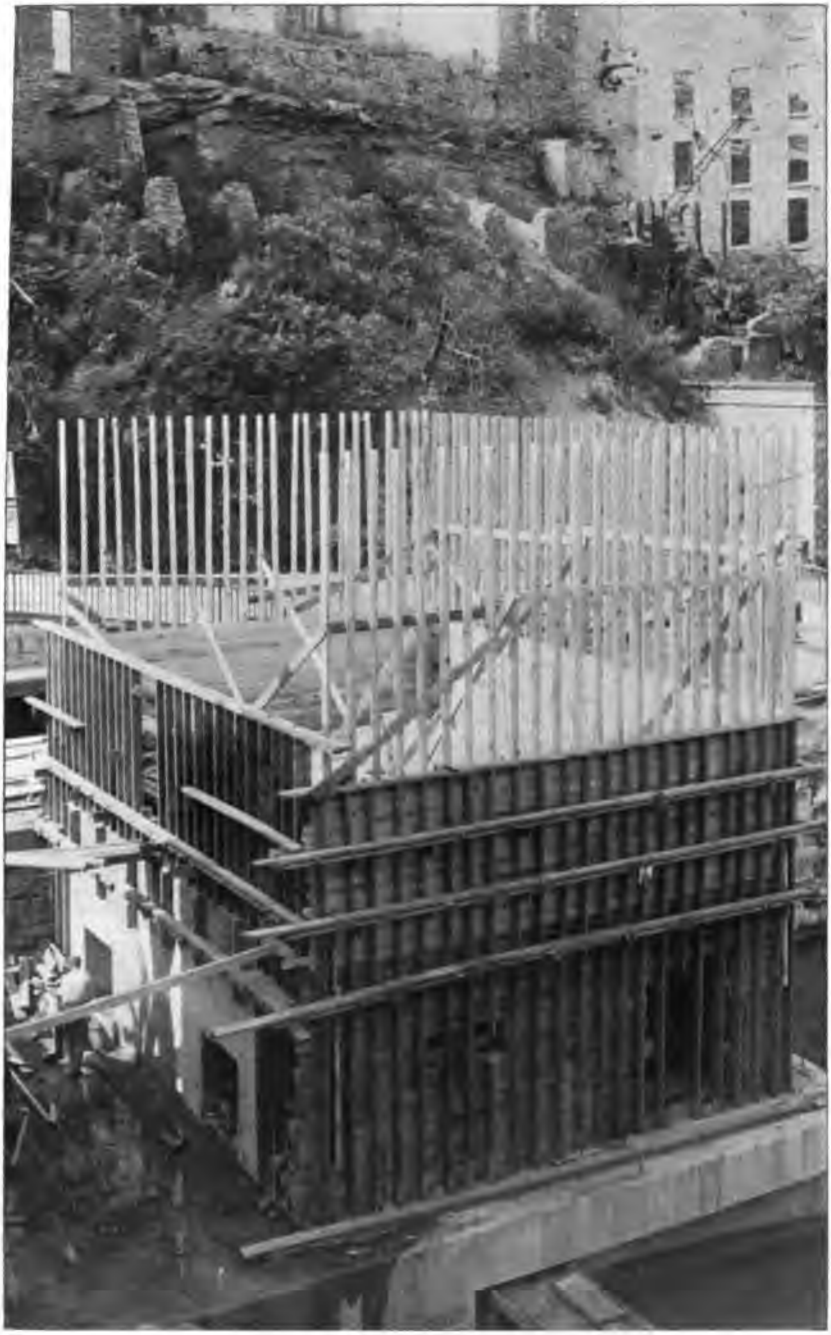
" This contract has been modified by alterations as follows:

" Alteration No. 1, approved by the Canal Board January 6, 1910, provides drainage culverts from State ditch into canal to prevent flooding of land and for additional excavation at east end of contract to match contract No. 67.

" Alteration No. 2, approved by the Canal Board April 14, 1910, provides new State ditch to replace old ditch to provide sufficient area for spoil; changes location of lateral culvert, etc.

" Alteration No. 3, approved by the Canal Board November 16, 1911, provides riprap below wash wall on account of soft material; for raising tow-path to get above present water-surface and for additional culvert entrance to replace old culvert.

" Alteration No. 4, approved by the Canal Board February 28, 1912, eliminates channeling on account of poor rock and to expedite work.



Barge Canal, Contract No. 94.
Building power-house at locks Nos. 34 and 35, Lockport.

" Alteration No. 5, approved by the Canal Board October 22, 1912, eliminates snubbing posts at Lockport harbor on account of terminal work.

" Alteration No. 6, approved by the Canal Board January 29, 1913, changes grade of berme to provide tow-path, etc.; provides drainage ditch at Hinman's road; eliminates removal of guard-lock at Sulphur Springs, on account of retention of present water-surface.

" As soon as the water was out of the canal in November the contractor put on a large force and pushed the work with vigor, completing the excavation of the prism before navigation opened. The contract was finished in July, 1913. Final estimates are now being prepared. Approximately 276,000 cu. yds. of earth and rock were removed from the prism during the year, the bulk of which was taken out between January 1 and May 1.

" The principal plant on the work was as follows: Steam-shovels and trains near Prospect street, which removed 27,400 cu. yds. of rock; cantilever excavator and conveyor, which removed 53,700 cu. yds. of earth between Riley's bridge and the new guard-gate; double boom crane and steam-shovel, which excavated 38,900 cu. yds. of rock west of Prospect street; a Browning crane excavator with tipple conveyor, which handled 27,500 cu. yds. of earth near Hawley's bridge, and steam-shovel and train outfits, which excavated 101,000 cu. yds. of rock and earth at Riley's bridge and Sulphur Springs bridge.

" Bridges at Prospect street, Hawley's road and Sulphur Springs were erected.

" The slopes of the earth cuts have been protected at various places by riprap.

" The contract was one of the heaviest cuts on the entire canal and the character of material and the necessity of maintaining navigation made the work especially difficult, so that the completion of the contract so promptly is particularly gratifying.

"The following table shows the work done during the year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining, lump sum	$10,000	$1,180	$10,000	11.8	100
Clearing .... lump sum	$2,000	0	$2,000	0	100
Excavation .... cu. yds.	2,346,717	275,926	2,200,506	11.7	93.8
Sheeting and bracing .... ft. B. M.	20,000	1,849	29,241	9.1	146
Channeling .... sq. ft.	191,760	27,403	191,679	14.3	100
Forming embankment .... cu. yds.	32,430	4,393	12,569	13.5	38.8
Lining .... cu. yds.	6,895	5,624	6,111	81.5	88.7
Sawed lumber, yellow pine or Douglas fir..ft. B. M.	12,000	5,791	9,427	48.2	78.5
Foundation piles .... lin. ft.	770	0	378	0	49.1
Second-class concrete .... cu. yds.	7,451	1,459	6,702	19.6	90
Third-class concrete .... cu. yds.	519	99	491	19.1	94.6
Reinforced concrete .... cu. yds.	554	127	519	22.9	93.7
First-class masonry bridge coping .... cu. yds.	11	9	9	81.8	81.8
Wash wall .... cu. yds.	45,768	21,053	40,112	46	87.7
Second-class stone paving .... sq. yds.	160	132	132	82.5	82.5
Third-class stone paving .... sq. yds.	1,124	773	773	68.8	68.8
Second-class riprap .... cu. yds.	150	35	78	23.3	52
Third-class riprap .... cu. yds.	334	213	238	63.8	71.3
Fourth-class riprap .... cu. yds.	36,100	17,444	34,248	48.5	95
Structural steel .... lbs.	627,140	326,849	605,358	52.1	96.5
Metal reinforcement .... lbs.	70,840	12,541	61,543	17.4	86.8
Metal in guard-gate .... lbs.	525,000	29,911	499,798	5.8	95.3
Wooden pavement, 2¼ in. thick .... sq. yds.	830	528	791	63.7	95.4
Wooden pavement, 3¼ in. thick .... sq. yds.	550	262	520	47.6	94.5
Wooden fence .... lin. ft.	904	416	967	46.2	107.1
Lattice railing .... lin. ft.	700	280	677	39.9	96.8
Drilling bolt holes in rock .... lin. ft.	550	42	458	7.6	83.2
Trenching and backfilling, 48-inch pipe .... lin. ft.	66	0	48	0	72.7
Relaying 48-inch cast iron pipe .... lin. ft.	66	0	48	0	72.7
Maintaining navigation .... lump sum	$5,000	$750	$5,000	15	100
Maintaining highway traffic .... lump sum	$500	$200	$500	40	100
Ditch excavation .... cu. yds.	38,520	0	24,093	0	62.6
Deduct sheeting and bracing used second time, ft. B. M.	....	2,566	2,566	......	....
Gross estimate	$2,237,256	$347,570	$2,086,100	15.5	93.4
Extra Work Orders.					
Dated June 19, 1910 .... unit prices	$85 80	....	$95 16	......	Finished.
Dated Sept. 18, 1912 .... unit prices	275 40	....	....	......	....
Dated Oct. 28, 1912 .... cost + 15%	....	....	627 82	......	Finished.

"*General Work.*

"Besides the usual engineering work incidental to construction, a survey party has been engaged in marking permanently, with concrete monuments, the new right of way and an offset center line along contract No. 66."

ERIE CANAL, RESIDENCY NO. 11.

Resident Engineer, George C. Andrews, reports:

"This residency extends from the Sulphur Springs guard-lock at Pendleton to and through the city of Buffalo. Two Barge canal contracts are embraced in this residency, contract No. 19 and one not yet advertised, which extends from the Delaware avenue bridge, Tonawanda, to the Niagara river, a distance of about 2,500 feet.

"*Contract No.* 19.

"This contract extends from the Pendleton guard-lock to Delaware avenue bridge, Tonawanda, a distance of 12.46 miles. O. L. Burdett, Assistant Engineer, is in charge.

"The contract was let to the Great Lakes Construction Company, of Buffalo, N. Y., on November 26, 1906. Work was begun on May 25, 1907. The original contract price was $1,002,171, but it has been affected by alterations, which reduced the amount of the contract by about $109,000.

"This contract has been modified by alterations as follows:

"Alteration No. 1, approved by the Canal Board May 26, 1908, changes spoil banks and slopes of prism; eliminates timber revetment; eliminates concrete-capped pile docking and wash wall; changes sheeting and bracing and foundations of walls on account of soft material encountered.

"Alteration No. 2, approved by the Canal Board November 24, 1908, changes specifications for concrete to secure better mixture and decrease cost.

"Alteration No. 3, approved by the Canal Board February 24, 1909, changes plans for Delaware avenue bridge piers to allow use of concrete instead of old masonry relaid.

"Alteration No. 6, approved by the Canal Board November 25, 1913, eliminates work through Tonawanda on account of interference with bridges, etc.; provides better foundation Picard's bridge, and for leaving in place coffer-dam, Station 6181, for future use.

"During the year 173,000 cu. yds. of material were removed from the prism, which completed the same except for a portion in the city of North Tonawanda, where the work cannot be done until a decision is reached in regard to the new location of the bridges. The excavation was made by the hydraulic dredge *Niagara* after the material had been excavated and cast over by the dipper dredge *Buffalo.*

"The work of rebuilding the timber dock at Martinsville with heavier material was completed and the structure is now giving satisfaction.

"A new road was built on the north side of the canal at Pickard's bridge, and 10,000 cu. yds. of fourth-class riprap were placed along the canal at various localities to prevent sloughing off of the slopes.

" The following table shows the work done during the year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation, guard-lock to Sta. 6180........cu. yds.	240,000	3,120	227,080	1.4	94.7
Excavation, Sta. 6180 to Tonawanda......cu. yds.	3,217,000	169,421	2,865,611	5.4	89.2
Sheeting and bracing...................ft. B. M.	974,000	3,070	1,041,311	0.3	106.9
Forming embankment....................cu. yds.	36,000	0	26,732	0	74.3
Lining..................................cu. yds.	2,200	85	990	3.9	45
Sawed lumber, yellow pine..............ft. B. M.	24,000	0	21,475	0	89.5
Sawed lumber, hemlock..................ft. B. M.	40,000	0	27,636	0	69.1
Round timber in cribs....................lin. ft.	16,000	0	20,285	0	126.8
Stone filling in cribs...................cu. yds.	850	0	552	0	64.9
Foundation piles, 20 ft. long.................No.	340	5	90	1.4	26.4
Fender piles, 30 ft. long.....................No.	40	0	9	0	22.5
Sheet-piling..........................ft. B. M.	44,000	0	44,567	0	101.3
Second-class concrete..................cu. yds.	15,900	0	12,987	0	81.7
Reinforced concrete....................cu. yds.	400	0	365	0	91.3
Metal reinforcement..........................lbs.	45,770	0	42,737	0	93.4
First-class masonry coping..............cu. yds.	6	0	3.9	0	65
Third-class riprap......................cu. yds.	360	0	56	0	15.6
Cobblestone paving.....................sq. yds.	95	0	62	0	65.1
Wooden fencing..........................lin. ft.	1,500	0	1,560	0	104
Structural steel.............................lbs.	257,640	0	243,960	0	94.7
Removing bridge superstructures........lump sum	$359	0	$359	0	100
Raising bridge superstructures..........lump sum	$3,599	0	$2,598 48	0	72.2
Maintaining traffic.....................lump sum	$599	0	$497 17	0	83
Gross estimate..................................	$891,401	$31,750	$781,440	4.7	87.7
Extra Work Orders.					
Dated Dec. 11, 1908.....................lump sum	$650	....	$650	......	Finished.
Dated Oct. 20, 1908...................unit prices	$1,310 40	....	$1,310 40	......	Finished.
Dated Sept. 30, 1908..................unit prices	$1,068	....	$1,417 65	......	Finished.
Dated June 26, 1908...................unit prices	$360	....	$360	......	Finished.
Dated Mar. 23, 1908...................unit prices	$300	....	$300	......	Finished.
Dated May 21, 1909....................unit prices	$384 72	....	$384 72	......	Finished.
Dated Oct. 12, 1909...................unit prices	$460 72	....	$460 72	......	Finished.
Dated July 26, 1909...................unit prices	$900	....	$906 20	......	Finished.
Dated June 7, 1911....................unit prices	$3,334 40	....	$3,107 72	......	Finished.
Dated April 3, 1912...................unit prices	$336	....	$335 28	......	Finished.
Dated May 16, 1912......................lump sum	$2,785	....	$2,785	......	Finished.
Dated Aug. 19, 1912.................cost + 15%	....	....	$102 79	......	Finished.
Dated April 13, 1912................cost + 15%	....	....	$12,595 67	......	Finished.
Dated Mar. 28, 1913.................cost + 15%	....	....	$105 80	......	Finished.
Dated July 18, 1913...................unit prices	$12,500	....	....	......	....
Dated March 10, 1913..................unit prices	$104	....	$103 40	......	Finished.

CONCLUSION.

A statement of the engineering expenses of the Division and table of contracts pending, as well as those completed during the fiscal year, follow.

I desire to thank you and your deputies for the consideration and help that you have given me in carrying on the work of the Division and to commend to you all the employees of the Division for their faithful services. I wish also to express my sincere thanks to the contractors for their loyal coöperation in carrying on the contract work on the Western Division.

Respectfully submitted,
EDWARD J. GOVERN,
Division Engineer.

THE FOLLOWING STATEMENTS SHOW THE NAME, RANK AND COMPENSATION OF ENGINEERS IN THE WESTERN DIVISION OF THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES FOR THE FISCAL YEAR ENDED SEPTEMBER 30, 1913.

Ordinary Repairs to Canals — Erie Canal.

Chapter 546, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edward J. Govern	Division engineer	$350 per month	$2,100 00		$2,100 00
Edward J. Govern	Division engineer	400 per month	2,178 06		2,178 06
Joseph H. Walburn	Cashier	150 per month	1,800 00		1,800 00
A. B. Williams	Estimate clerk	150 per month	1,800 00		1,800 00
Anna M. Lorscheider	Stenographer	100 per month	1,200 00		1,200 00
Total					$9,078 06

Construction of Barge Canal — Erie Canal.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edward J. Govern	Division engineer	$400 per month	$80 00	$397 40	$477 40
Edward J. Govern	Division engineer	350 per month		418 28	418 28
H. J. Knoppel	Supervisory engineer	250 per month	3,000 00	970 27	3,970 27
Waldo G. Wildes	Resident engineer	250 per month	2,983 00	132 22	3,116 09
B. E. Failing	Resident engineer	250 per month	2,250 00	320 41	2,570 41
J. V. Hogan	Resident engineer	250 per month	2,991 67	341 31	3,332 98
George C. Andrews	Resident engineer	250 per month	3,000 00	301 18	3,301 18
B. E. Failing	Resident engineer	225 per month	675 00	46 10	721 10
O. F. Bellows	Resident engineer	225 per month	2,670 97		2,670 97
O. L. Burdett	Assistant engineer	7 00 per day	182 00	38 27	220 27
Edward Anderberg	Assistant engineer	7 00 per day	1,582 00	10 30	1,592 30
W. T. Huber	Assistant engineer	7 00 per day	1,008 00	135 19	1,143 19
C. R. Waters	Assistant engineer	7 00 per day	1,659 00	270 69	1,929 69
Carl Ashley	Assistant engineer	7 00 per day	1,701 00	444 89	2,145 89
C. L. Baldwin	Assistant engineer	7 00 per day	1,127 00	31 02	1,158 02
H. R. Wickham	Assistant engineer	7 00 per day	364 00		364 00
Gordon Edson	Assistant engineer	7 00 per day	364 00	3 90	367 90
C. D. Murray	Assistant engineer	7 00 per day	357 00	15 36	372 36
H. N. Metzger	Assistant engineer	7 00 per day	1,309 00	108 93	1,417 93
F. W. Madegan	Assistant engineer	7 00 per day	1,365 00	142 27	1,507 27
F. J. Wilbur	Assistant engineer	7 00 per day	1,638 00	7 13	1,645 13
A. S. Whitbeck	Assistant engineer	7 00 per day	1,645 00	12 28	1,657 28
R. H. Merrill	Assistant engineer	7 00 per day	1,603 00	122 56	1,725 56
J. S. Summers	Assistant engineer	7 00 per day	1,736 00	438 58	2,174 58
J. S. Bixby	Assistant engineer	6 00 per day	756 00	48 35	804 35
W. L. Coler	Assistant engineer	6 00 per day	660 00	9 53	669 53
H. W. Hale	Assistant engineer	6 00 per day	606 00	8 53	614 53
O. L. Burdett	Assistant engineer	6 00 per day	1,626 00	109 19	1,735 19
Edward Anderberg	Assistant engineer	6 00 per day	480 00	2 80	482 80
W. T. Huber	Assistant engineer	6 00 per day	474 00	69 60	543 60
B. L. Vandervoort	Assistant engineer	6 00 per day	84 00		84 00
R. C. Georger	Assistant engineer	6 00 per day	1,422 00	210 77	1,632 77
J. B. Doyle	Assistant engineer	6 00 per day	156 00		156 00
C. H. Swick	Assistant engineer	6 00 per day	1,212 00		1,212 00
G. S. Haight	Assistant engineer	6 00 per day	1,122 00		1,122 00
A. P. Mussi	Assistant engineer	6 00 per day	1,098 00	32 81	1,130 81
C. R. Waters	Assistant engineer	6 00 per day	540 00	184 54	724 54
Carl Ashley	Assistant engineer	6 00 per day	480 00	24 45	504 45

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
G. D. Kellogg	Assistant engineer	$6 00 per day	$1,728 00	....	$1,728 00
C. L. Baldwin	Assistant engineer	6 00 per day	474 00	$50 51	524 51
H. R. Wickham	Assistant engineer	6 00 per day	1,578 00	13 14	1,591 14
Gordon Edson	Assistant engineer	6 00 per day	1,566 00	17 40	1,583 40
C. D. Murray	Assistant engineer	6 00 per day	510 00	49 38	559 38
H. N. Metzger	Assistant engineer	6 00 per day	804 00	110 18	914 18
F. W. Madigan	Assistant engineer	6 00 per day	840 00	83 20	923 20
D. E. Bellows	Assistant engineer	6 00 per day	1,878 00	13 15	1,891 15
F. T. Marsh	Assistant engineer	6 00 per day	1,878 00	222 96	2,100 96
F. J. Wilbur	Assistant engineer	6 00 per day	474 00	....	474 00
E. P. Strowger	Assistant engineer	6 00 per day	432 00	....	432 00
B. W. Rosenkrans	Assistant engineer	6 00 per day	960 00	....	960 00
C. E. Elmendorf	Assistant engineer	6 00 per day	1,434 00	135 46	1,569 46
A. S. Whitbeck	Assistant engineer	6 00 per day	474 00	....	474 00
R. H. Merrill	Assistant engineer	6 00 per day	468 00	35 18	503 18
F. C. Koerner	Assistant engineer	6 00 per day	1,896 00	....	1,896 00
A. S. Millinowski	Assistant engineer	6 00 per day	1,878 00	77 61	1,955 61
J. S. Summers	Assistant engineer	6 00 per day	486 00	43 18	529 18
L. G. Fisher	Assistant engineer	6 00 per day	1,128 00	....	1,128 00
C. E. Elmendorf	Assistant engineer	5 50 per day	445 50	8 50	527 00
W. M. Steive	Assistant engineer	5 00 per day	260 00	26 33	286 33
J. J. Hynes, Jr	Assistant engineer	5 00 per day	210 00	7 25	217 25
W. W. Brown	Assistant engineer	5 00 per day	550 00	....	550 00
B. L. Hall	Assistant engineer	5 00 per day	555 00	....	555 00
J. F. Back	Assistant engineer	5 00 per day	550 00	....	550 00
P. L. Arnold	Assistant engineer	5 00 per day	550 00	....	550 00
J. B. Stobl	Assistant engineer	5 00 per day	30 00	....	30 00
R. Mack	Assistant engineer	5 00 per day	70 00	....	70 00
R. C. Georger	Assistant engineer	5 00 per day	380 00	69 43	449 43
T. J. Loomis	Assistant engineer	5 00 per day	235 00	5 18	240 18
R. D. Cameron	Assistant engineer	5 00 per day	1,430 00	....	1,430 00
C. H. Swick	Assistant engineer	5 00 per day	685 00	....	685 00
G. S. Haight	Assistant engineer	5 00 per day	665 00	....	665 00
A. P. Mussi	Assistant engineer	5 00 per day	670 00	....	670 00
F. T. Lawton	Assistant engineer	5 00 per day	1,692 00	101 25	1,793 25
F. J. Doerhoefer	Assistant engineer	5 00 per day	550 00	....	550 00
H. H. Stickney	Assistant engineer	5 00 per day	675 00	2 80	677 80
A. G. Slatcher	Assistant engineer	5 00 per day	310 00	....	310 00
J. B. Doyle	Assistant engineer	5 00 per day	435 00	....	435 00
Frank V. Searls	Estimate clerk	150 per month	1,720 51	219 77	1,940 28
Dora Hamilton	Confidential stenographer	125 per month	1,500 00	....	1,500 00
Emma M. Repp	Stenographer	75 per month	776 61	....	776 61
A. Edith Schoeller	Stenographer	75 per month	900 00	....	900 00
Edna L. Deidrich	Stenographer	75 per month	48 39	....	48 39
Ruth B. Schillinger	Stenographer	60 per month	90 97	....	90 97
Tracy B. Smith	Draftsman	5 00 per day	1,550 00	....	1,550 00
Charles R. Zorsch	Draftsman	5 00 per day	1,220 00	....	1,220 00
H. H. Stickney	Draftsman	5 00 per day	840 00	....	840 00
H. Clyde Row	Draftsman	5 00 per day	1,310 00	2 60	1,312 60
C. J. Alber	Draftsman	5 00 per day	780 00	....	780 00
A. B. Chappell	Draftsman	5 00 per day	1,080 00	....	1,080 00
Jerome Lowey	Draftsman	4 50 per day	139 50	....	139 50
Joseph Fernstein	Draftsman	4 50 per day	301 50	....	301 50
Albert J. Mantica	Draftsman	4 00 per day	212 00	....	212 00
Phillip Rapp	Draftsman	4 00 per day	136 00	....	136 00
J. A. Murray, Jr.	Draftsman	4 00 per day	80 00	....	80 00
Guernsey W. Ellis	Draftsman	4 00 per day	52 00	1 14	53 14
John Mockler	Draftsman	4 00 per day	372 00	....	372 00
Jas. G. Allan	Tracer	83 33 per month	921 67	....	921 67
W. J. Burns	Tracer	83 33 per month	682 45	1 00	683 45
L. P. Slade	Leveler	5 00 per day	130 00	....	130 00
M. F. Dullea	Leveler	5 00 per day	285 00	....	285 00
Burr M. Stark	Leveler	5 00 per day	575 00	....	575 00
W. W. Brown	Leveler	5 00 per day	635 00	....	635 00
F. J. Doerhoefer	Leveler	5 00 per day	730 00	....	730 00
D. T. Simpson	Leveler	5 00 per day	395 00	....	395 00
A. A. Levison	Leveler	5 00 per day	130 00	....	130 00
D. M. Miner	Leveler	5 00 per day	130 00	....	130 00
J. J. Hynes, Jr	Leveler	5 00 per day	1,015 00	....	1,015 00
B. L. Hall	Leveler	5 00 per day	1,015 00	....	1,015 00
J. F. Back	Leveler	5 00 per day	1,015 00	....	1,015 00
J. B. Doyle	Leveler	5 00 per day	1,090 00	....	1,090 00

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
H. J. Simimlink	Leveler	$5 00 per day	$980 00		$980 00
P. L. Arnold	Leveler	5 00 per day	1,015 00		1,015 00
C. M. Chuckrow	Leveler	4 50 per day	63 00		63 00
L. C. Purdy	Leveler	4 50 per day	70 00		70 00
L. P. Slade	Leveler	4 50 per day	1,170 00		1,170 00
M. F. Dullea	Leveler	4 50 per day	1,125 00		1,125 00
P. A. Volcker	Leveler	4 50 per day	1,369 00		1,369 00
L. F. Eggleston	Leveler	4 50 per day	1,435 50		1,435 50
J. L. Ames	Leveler	4 50 per day	1,229 00		1,229 00
Burr M. Stark	Leveler	4 50 per day	598 50		598 50
H. Rozinski	Leveler	4 50 per day	522 00		522 00
B. S. Bascome	Leveler	4 50 per day	175 50		175 50
F. L. VanPatten	Leveler	4 50 per day	522 00		522 00
E. E. Harkness	Leveler	4 50 per day	211 50		211 50
S. Rosenberg	Leveler	4 50 per day	238 50		238 50
J. H. Bovier	Leveler	4 50 per day	517 50		517 50
Jacob Gadlowitz	Leveler	4 50 per day	234 00		234 00
Albert J. Mantica	Leveler	4 50 per day	67 50		67 50
Dennis P. O'Neill	Leveler	4 50 per day	85 50		85 50
H. F. Brumm	Leveler	4 50 per day	589 50		589 50
Phillip Rapp	Leveler	4 50 per day	153 00		153 00
F. M. White	Leveler	4 50 per day	535 50		535 50
J. A. Palmer	Leveler	4 50 per day	1,030 50	$8 90	1,039 40
D. T. Simpson	Leveler	4 50 per day	964 50		964 50
A. A. Levison	Leveler	4 50 per day	1,201 50		1,201 50
D. M. Miner	Leveler	4 50 per day	1,188 00		1,188 00
Joseph Bleich	Leveler	4 50 per day	486 00	5 55	491 55
E. G. Edwards	Leveler	4 50 per day	135 00		135 00
Samuel Levine	Leveler	4 50 per day	670 50		670 50
W. C. Stuart	Leveler	4 50 per day	648 00		648 00
D. B. Williams	Leveler	4 50 per day	171 00		171 00
George Fuller	Leveler	4 50 per day	468 00		468 00
George Dunlop	Rodman	4 00 per day	208 00		208 00
H. J. Whitman	Rodman	4 00 per day	208 00		208 00
Frank E. Simpson	Rodman	4 00 per day	513 50		513 50
M. G. Cain	Rodman	4 00 per day	100 00		100 00
Fred C. Davis	Rodman	4 00 per day	104 00		104 00
Laurence Bentley	Rodman	4 00 per day	104 00		104 00
B. Z. Wildenberg	Rodman	4 00 per day	108 00		108 00
J. C. Cowie	Rodman	4 00 per day	104 00		104 00
H. J. McCadden	Rodman	4 00 per day	208 00		208 00
J. W. Howe	Rodman	4 00 per day	1,328 00		1,328 00
J. Lyons	Rodman	4 00 per day	1,280 00		1,280 00
D. T. Simpson	Rodman	4 00 per day	108 00		108 00
W. G. Digbey	Rodman	4 00 per day	1,168 00		1,168 00
John Mockler	Rodman	4 00 per day	644 00		644 00
W. H. Ginnity	Rodman	4 00 per day	696 00		696 00
H. L. Cooke	Rodman	4 00 per day	552 00		552 00
L. R. Gilbert	Rodman	4 00 per day	928 00		928 00
J. H. Bovier	Rodman	4 00 per day	780 00		780 00
F. C. Facer	Rodman	4 00 per day	1,296 00		1,296 00
W. C. R. Pyne	Rodman	4 00 per day	1,292 00		1,292 00
F. M. White	Rodman	4 00 per day	804 00		804 00
M. F. Dullea	Rodman	4 00 per day	124 00		124 00
Paul A. Volcker	Rodman	4 00 per day	116 00		116 00
C. S. Deitz	Rodman	4 00 per day	620 00		620 00
T. S. Fillebrown	Rodman	4 00 per day	536 00	12 10	548 10
L. P. Slade	Rodman	4 00 per day	108 00		108 00
W. Robinson	Rodman	4 00 per day	1,016 00		1,016 00
D. M. Miner	Rodman	4 00 per day	108 00		108 00
C. M. Colony	Rodman	4 00 per day	1,268 00		1,268 00
A. A. Levison	Rodman	4 00 per day	108 00		108 00
Loren E. Mason, Jr	Rodman	4 00 per day	84 00		84 00
George Dunlop	Rodman	3 50 per day	945 00		945 00
H. J. Whitman	Rodman	3 50 per day	959 00		959 00
Frank E. Simpson	Rodman	3 50 per day	626 50		626 50
Frank M. Hardiman	Rodman	3 50 per day	1,109 50		1,109 50
M. G. Cain	Rodman	3 50 per day	983 50		983 50
Fred. C. Davis	Rodman	3 50 per day	955 50		955 50
Wm. M. J. Lewis	Rodman	3 50 per day	175 00		175 00
Jas. A. Daly	Rodman	3 50 per day	378 00		378 00
A. W. Holmes	Rodman	3 50 per day	49 00		49 00
E. S. Austin	Rodman	3 50 per day	122 50		122 50

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
G. M. Biales	Rodman	$3 50 per day	$325 50		$325 50
J. A. Noonan	Rodman	3 50 per day	462 00		462 00
Laurence Bentley	Rodman	3 50 per day	1,022 00		1,022 00
John M. Barney	Rodman	3 50 per day	773 50		773 50
B. Z. Wildenberg	Rodman	3 50 per day	1,018 50		1,018 50
L. C. Loomis	Rodman	3 50 per day	87 50		87 50
J. C. Cowie	Rodman	3 50 per day	1,011 50		1,011 50
H. J. McCadden	Rodman	3 50 per day	899 50		899 50
B. S. Deavenport	Rodman	3 50 per day	70 00		70 00
Powell Wall	Rodman	3 50 per day	140 00		140 00
H. A. Ingersoll	Rodman	3 50 per day	1,027 00		1,027 00
N. Breslow	Rodman	3 50 per day	255 50		255 50
T. D. Eaton	Rodman	3 50 per day	402 50		402 50
Chas. E. Heydt	Rodman	3 50 per day	360 50		360 50
M. J. Fitzgerald	Rodman	3 50 per day	381 50		381 50
E. Maguire	Rodman	3 50 per day	147 00		147 00
E. G. Middleton	Rodman	3 50 per day	161 00		161 00
L. F. Walsh	Rodman	3 50 per day	224 00		224 00
H. F. Eagan	Rodman	3 50 per day	672 00		672 00
Nathan Levy	Rodman	3 50 per day	836 50		836 50
W. V. D. Tiedeman	Rodman	3 50 per day	112 00		112 00
Samuel Weisman	Rodman	3 50 per day	528 50		528 50
Gaylord Riggs	Rodman	3 50 per day	374 50		374 50
E. A. Close	Rodman	3 50 per day	539 00		539 00
Leslie Ames	Rodman	3 50 per day	574 00		574 00
I. J. Katz	Rodman	3 50 per day	189 00		189 00
W. N. Whitney	Rodman	3 50 per day	203 00		203 00
O. J. Pierce	Rodman	3 50 per day	70 00		70 00
F. A. Biderman	Chainman	3 00 per day	78 00		78 00
G. Prenner	Chainman	3 00 per day	122 00		122 00
L. R. Ames	Chainman	3 00 per day	87 00		87 00
W. F. Lysett	Chainman	3 00 per day	918 00		918 00
W. H. Barhyte	Chainman	3 00 per day	384 00		384 00
P. M. Howe	Chainman	3 00 per day	939 00		939 00
S. A. Miller	Chainman	3 00 per day	63 00		63 00
F. G. Hempel	Chainman	3 00 per day	939 00		919 00
C. F. Doty	Chainman	3 00 per day	951 00		951 00
Theophilus Beaupre	Chainman	3 00 per day	969 00		969 00
H. A. Shafer	Chainman	3 00 per day	987 00		987 00
Frank M. Sisson	Chainman	3 00 per day	878 00	$28 60	906 60
W. H. Saunders	Chainman	3 00 per day	927 00		927 00
B. Z. Wildenberg	Chainman	3 00 per day	9 00		9 00
E. J. Greiner	Chainman	3 00 per day	951 00		951 00
J. J. Sullivan	Chainman	3 00 per day	903 00		903 00
F. J. O'Connor	Chainman	3 00 per day	939 00		939 00
Jas. Wilson	Chainman	3 00 per day	984 00		984 00
E. J. Bullis	Chainman	3 00 per day	945 00	5 29	950 29
C. T. Smith	Chainman	3 00 per day	987 00		987 00
Frank E. Simpson	Chainman	3 00 per day	9 00		9 00
H. A. Ingersoll	Chainman	3 00 per day	81 00		81 00
Edward Dowd	Chainman	3 00 per day	258 00		258 00
F. G. Kimball	Chainman	3 00 per day	726 00		726 00
W. J. Ryan	Chainman	3 00 per day	984 00		984 00
L. T. Phillips	Chainman	3 00 per day	1,057 00		1,057 00
W. B. Green	Chainman	3 00 per day	606 00		606 00
C. N. Budlong	Chainman	3 00 per day	447 00		447 00
N. Simonowitz	Chainman	3 00 per day	130 00		130 00
Jas. Boucher	Chainman	3 00 per day	195 00		195 00
F. A. Biderman	Chainman	2 50 per day	605 00		605 00
G. Prenner	Chainman	2 50 per day	642 50		642 50
L. R. Ames	Chainman	2 50 per day	332 50		332 50
W. H. Davis	Chainman	2 50 per day	45 00		45 00
N. Simonowitz	Chainman	2 50 per day	172 50		172 50
Simon Miller	Chainman	2 50 per day	105 00		105 00
Biron W. Kinne	Chainman	2 50 per day	35 00		35 00
M. H. McConnell	Chainman	2 50 per day	102 50		102 50
F. H. Simpson	Chainman	2 50 per day	60 00		60 00
L. P. Lynch	Inspector	5 00 per day	1,685 00		1,685 00
G. M. Harrer	Inspector	5 00 per day	1,635 00		1,635 00
W. W. Barclay	Inspector	5 00 per day	1,013 00		1,013 00
C. M. Leet	Inspector	5 00 per day	1,679 00		1,679 00
hos. McMorrow	Inspector	5 00 per day	1,660 00		1,660 00

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
E. L. Wick	Inspector	$5 00 per day	$1,680 00		$1,680 00
J. V. Donnelly	Inspector	5 00 per day	130 00		130 00
J. V. Donnelly	Inspector	4 50 per day	1,291 50		1,291 50
L. H. Brandt	Inspector	4 00 per day	208 00		208 00
A. W. Balliett	Inspector	4 00 per day	208 00		208 00
H. B. Failing	Inspector	4 00 per day	116 00		116 00
S. A. Miller	Inspector	4 00 per day	104 00		104 00
L. H. Brandt	Inspector	3 50 per day	969 50		969 50
A. W. Balliett	Inspector	3 50 per day	948 50		948 50
H. B. Failing	Inspector	3 50 per day	1,074 50		1,074 50
S. A. Miller	Inspector	3 50 per day	968 50		968 50
W. H. Barhyte	Inspector	3 50 per day	276 50		276 50
John J. Nugent	Chauffeur	115 per month	211 45	$50 50	261 95
John J. Nugent	Chauffeur	100 per month	993 55	124 33	1,117 88
T. W. Holcomb	Electrical engineer	150 per month	785 00	193 01	978 01
Chas. A. D'Arcy	Electrical engineer	150 per month	485 00	24 24	509 24
H. Kramer	Foreman of borings	5 00 per day	825 00	9 08	834 08
Fred H. Palmer	Foreman of borings	4 00 per day	572 00		572 00
H. Stoneberg	Foreman of borings	4 00 per day	404 00		404 00
Fred B. Sherman	Boatman	3 00 per day	732 00		732 00
Fred Unger	Boatman	3 00 per day	723 00		723 00
R. N. Hale	Boatman	3 00 per day	399 00		399 00
Albert A. Evans	Boatman	3 00 per day	27 00		27 00
E. J. Burns	Boatman	3 00 per day	507 00		507 00
E. N. Parker	Boatman	3 00 per day	12 00		12 00
T. F. Moran	Boatman	3 00 per day	282 00		282 00
Saul C. Nova	Boatman	3 00 per day	165 00		165 00
John F. Carroll	Boatman	3 00 per day	78 00		78 00
Wm. F. Guenther	Boatman	3 00 per day	534 00		534 00
James Hutt	Boatman	3 00 per day	318 00	1 30	319 30
Joseph Berger	Boatman	3 00 per day	207 00		207 00
M. Unger	Boatman	3 00 per day	285 00		285 00
F. J. Converse	Boatman	3 00 per day	255 00		255 00
George W. Jones	Boatman	3 00 per day	168 00		168 00
M. H. McConnell	Boatman	3 00 per day	282 00		282 00
J. M. Fagan	Boatman	3 00 per day	120 00		120 00
S. Hutchinson	Boatman	3 00 per day	36 00		36 00
Nelson E. Hubbell	Boatman	3 00 per day	69 00		69 00
Hiram J. Wolfe	Boatman	3 00 per day	237 00		237 00
F. McGuire	Boatman	3 00 per day	156 00		156 00
L. Simpson	Boatman	3 00 per day	138 00		138 00
L. Durnherr	Boatman	3 00 per day	81 00		81 00
I. J. Whitney	Boatman	3 00 per day	315 00		315 00
John Rackl	Boatman	3 00 per day	120 00		120 00
G. M. Parkhurst	Boatman	3 00 per day	45 00		45 00
Archie Ventras	Boatman	3 00 per day	474 00		474 00
E. A. Faille	Boatman	3 00 per day	954 00		954 00
E. Mahoney	Boatman	3 00 per day	972 00		972 00
C. J. Lahey	Boatman	3 00 per day	927 00		927 00
Wm. Sterritt	Boatman	3 00 per day	435 00		435 00
Wm. Dwyer	Boatman	3 00 per day	492 00		492 00
Finla L. Jones	Axeman	2 50 per day	667 50		667 50
George E. Merry	Axeman	2 50 per day	787 50		787 50
Lynn H. Barrows	Axeman	2 50 per day	642 50		642 50
O. M. Punch	Axeman	2 50 per day	687 50		687 50
Edward McGurn	Laborer	2 00 per day	488 00		488 00
I. J. Whitney	Laborer	2 00 per day	420 00		420 00
Archie Ventras	Laborer	2 00 per day	312 00		312 00
Martin Hickey	Laborer	2 00 per day	528 00		528 00
Wm. M. Sterritt	Laborer	2 00 per day	280 00		280 00
Wm. F. Guenther	Laborer	2 00 per day	252 00		252 00
Peter Felix	Laborer	2 00 per day	44 00		44 00
Steve Bososki	Laborer	2 00 per day	34 00		34 00
Frank Steposkene	Laborer	2 00 per day	46 00		46 00
Dan Yutek	Laborer	2 00 per day	44 00		44 00
Mike Hyrn	Laborer	2 00 per day	34 00		34 00
Frank Komoki	Laborer	2 00 per day	10 00		10 00
T. F. Moran	Laborer	2 00 per day	230 00		230 00
Edward Quanz	Laborer	2 00 per day	390 00		390 00
Edward J. Burns	Laborer	2 00 per day	178 00		178 00
John McCarthy	Laborer	2 00 per day	38 00		38 00
Roy Legan	Laborer	2 00 per day	43 00		43 00

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Mike Goebel	Laborer	$2 00 per day	$30 00		$30 00
J. P. Lawyer	Laborer	2 00 per day	226 00		226 00
J. W. Fraher, Jr	Laborer	2 00 per day	604 00		604 00
J. Hart	Laborer	2 00 per day	614 00		614 00
F. J. Madden	Laborer	2 00 per day	522 00		522 00
J. B. Roberts	Laborer	2 00 per day	260 00		260 00
Leo Durnherr	Laborer	2 00 per day	14 00		14 00
T. R. Gaffney	Laborer	2 00 per day	16 00		16 00
J. Dowd	Laborer	2 00 per day	22 00		22 00
John M. Coleman	Laborer	2 00 per day	8 00		8 00
M. H. McConnell	Laborer	2 00 per day	230 00		230 00
R. N. Hale	Laborer	2 00 per day	228 00		228 00
C. E. Crowley	Laborer	2 00 per day	106 00		106 00
N. J. O'Mealia	Laborer	2 00 per day	628 00		628 00
E. A. Close	Laborer	2 00 per day	38 00		38 00
E. W. Burke	Laborer	2 00 per day	496 00		496 00
K. H. Dix	Laborer	2 00 per day	122 00		122 00
E. L. Kelly	Laborer	2 00 per day	418 00		418 00
W. T. Burke	Laborer	2 00 per day	80 00		80 00
C. R. Elliott	Laborer	2 00 per day	106 00		106 00
M. Kirsch	Laborer	2 00 per day	600 00		600 00
G. A. Lewis	Laborer	2 00 per day	72 00		72 00
J. E. McNulty	Laborer	2 00 per day	636 00		636 00
T. E. Williams	Laborer	2 00 per day	106 00		106 00
E. M. Ryan	Laborer	2 00 per day	626 00		626 00
B. McCabe	Laborer	2 00 per day	654 00		654 00
E. C. Warren	Laborer	2 00 per day	464 00		464 00
D. Lawler	Laborer	2 00 per day	106 00		106 00
J. Corbett	Laborer	2 00 per day	106 00		106 00
R. T. Speigel	Laborer	2 00 per day	674 00		674 00
C. L. Foster	Laborer	2 00 per day	656 00		656 00
John Ritsenthaler	Laborer	2 00 per day	500 00		500 00
C. Kumeo	Laborer	2 00 per day	620 00		620 00
Harry E. Rose	Laborer	2 00 per day	608 00		608 00
H. B. Riesterer	Laborer	2 00 per day	588 00		588 00
J. M. Fagan	Laborer	2 00 per day	26 00		26 00
Leon Simpson	Laborer	2 00 per day	26 00		26 00
C. R. Kirby	Laborer	2 00 per day	20 00		20 00
F. B. Monaghan	Laborer	2 00 per day	80 00		80 00
John J. Lynch	Laborer	2 00 per day	60 00		60 00
A. T. Sinclair	Laborer	2 00 per day	626 00		626 00
Peter Arnold	Laborer	2 00 per day	212 00		212 00
Cornelius Crowley	Laborer	2 00 per day	58 00		58 00
M. Unger	Laborer	2 00 per day	468 00		468 00
E. B. Male	Laborer	2 00 per day	646 00		646 00
Wm. Harris	Laborer	2 00 per day	652 00		652 00
Ira J. Foster	Laborer	2 00 per day	642 00		642 00
C. H. Schell	Laborer	2 00 per day	724 00		724 00
John Finnegan	Laborer	2 00 per day	112 00		112 00
Patrick O'Donnell	Laborer	2 00 per day	106 00		106 00
George McFarland	Laborer	2 00 per day	656 00		656 00
Joseph Rickard	Laborer	2 00 per day	626 00		626 00
Leo G. Cooley	Laborer	2 00 per day	606 00		606 00
Irving O'Keefe	Laborer	2 00 per day	554 00		554 00
George Milliner	Laborer	2 00 per day	632 00		632 00
Rok. Polko	Laborer	2 00 per day	42 00		42 00
M. Cunningham	Laborer	2 00 per day	16 00		16 00
Joseph Carson	Laborer	2 00 per day	12 00		12 00
Jacob Weekley	Laborer	2 00 per day	112 00		112 00
Roland Westbrook	Laborer	2 00 per day	146 00		146 00
Henry Madden	Laborer	2 00 per day	168 00		168 00
Thos. H. Lee, Jr	Laborer	2 00 per day	114 00		114 00
Ralph Beebe	Laborer	2 00 per day	184 00		184 00
F. J. Bauman	Laborer	2 00 per day	626 00		626 00
W. J. Kewin	Laborer	2 00 per day	106 00		106 00
H. J. Wolfe	Laborer	2 00 per day	470 00		470 00
Sylvanus Bailey	Laborer	2 00 per day	158 00		158 00
J. H. Madden	Laborer	2 00 per day	106 00		106 00
J. J. Westbrook	Laborer	2 00 per day	112 00		112 00
J. F. Carroll	Laborer	2 00 per day	550 00		550 00
R. Maxwell	Laborer	2 00 per day	712 00		712 00
. W. Brandt	Laborer	2 00 per day	610 00		610 00

Construction of Barge Canal — Erie Canal — (Concluded).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Joseph Berger	Laborer	$2 00 per day	$586 00	....	$586 00
A. R. Poyser	Laborer	2 00 per day	648 00	....	648 00
T. J. Griffin	Laborer	2 00 per day	98 00	....	98 00
Wm. A. Beal, Jr	Laborer	2 00 per day	722 00	....	722 00
Carl Tuscher	Gage reader	5 per month	60 00	....	60 00
Wm. Swarts	Gage reader	5 per month	60 00	....	60 00
C. Henry Harrison	Gage reader	5 per month	60 00	....	60 00
Patrick Slavin	Gage reader	5 per month	60 00	....	60 00
Jacob Snell, Jr	Gage reader	5 per month	42 00	....	42 00
Wm. Carroll	Gage reader	7 per month	63 00	....	63 00
Homer Snell	Gage reader	6 per month	30 00	....	30 00
					$245,769 72
Incidental Expenses.					
Instruments, tools and appliances				$151 62	
Office rent				4,304 24	
Fuel and light				480 63	
Stationery and printing				364 84	
Telephone and telegraph				1,941 75	
Postage				469 59	
Miscellaneous				19,073 83	
					26,786 50
Total					$272,556 22

Chadakoin River Improvement.

Chapter 758, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edward J. Govern	Division engineer	$350 per month	....	$31 96	$31 96
Edward J. Govern	Division engineer	400 per month	$64 52	26 03	90 55
J. J. Hynes, Jr	Assistant engineer	5 00 per day	210 00	294 25	504 25
J. J. Hynes, Jr	Assistant engineer	6 00 per day	156 00	47 66	203 66
F. V. Searls	Estimate clerk	150 per month	69 81	64 69	134 50
John J. Nugent	Chauffeur	115 per month	11 13	5 75	16 88
Tracy B. Smith	Draftsman	5 00 per day	15 00	15 91	30 91
J. Loewy	Draftsman	4 50 per day	216 00	....	216 00
S. Rosenberg	Leveler	4 50 per day	306 00	....	306 00
E. J. Maguire	Rodman	3 50 per day	147 00	....	147 00
R. O. Graham	Laborer	2 00 per day	72 00	....	72 00
William Eklund	Laborer	2 00 per day	72 00	....	72 00
					$1,825 71
Incidental Expenses.					
Livery				$14 50	
Fuel and light				66	
Postage				46	
Office rent				22 00	
Telephone and telegraph				4 65	
Miscellaneous				41 20	
					83 47
Total					$1,909 18

Chemung River Improvement.

Chapter 732, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edward J. Govern	Division engineer	$400 per month	$25 81	$15 80	$41 61
C. L. Baldwin	Assistant engineer	7 00 per day	119 00	78 90	197 90
John J. Nugent	Chauffeur	115 per month	7 42	8 00	15 42
B. S. Bascome	Leveler	4 50 per day	99 00		99 00
E. G. Middleton	Rodman	3 50 per day	42 00		42 00
W. M. J. Lewis	Rodman	3 50 per day	14 00		14 00
C. E. Heydt	Rodman	3 50 per day	21 00		21 00
F. G. Kimball	Chainman	3 00 per day	45 00		45 00
D. M. Bowes	Boatman	3 00 per day	21 00		21 00
J. J. Donnelly	Laborer	2 00 per day	14 00		14 00
					$510 93
Incidental Expenses.					
Stationery and printing				$0 05	
Miscellaneous				18 25	
					18 30
Total					$529 23

Canisteo River Improvement.

Chapter 750, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edward J. Govern	Division engineer	$400 per month	$25 80	$4 00	$29 80
Waldo G. Wildes	Resident engineer	250 per month	16 13	3 10	19 23
C. L. Baldwin	Assistant engineer	7 00 per day	392 00	257 29	649 29
F. W. Searls	Estimate clerk	150 per month	9 68	3 50	13 18
John J. Nugent	Chauffeur	100 per month	6 45	3 50	9 95
B. S. Bascome	Leveler	4 50 per day	220 50		220 50
E. G. Middleton	Rodman	3 50 per day	178 50		178 50
W. M. J. Lewis	Roeman	3 50 per day	94 50		94 50
F. G. Kimball	Chainman	3 00 per day	168 00		168 00
E. J. Bullis	Chainman	3 00 per day	24 00		24 00
D. M. Bowes	Boatman	3 00 per day	114 00		114 00
J. J. Donnelly	Laborer	2 00 per day	58 00		58 00
					$1,578 95
Incidental Expenses.					
Stationery and printing				$0 60	
Telephone and telegraph				70	
Miscellaneous				42 05	
					43 35
Total					$1,622 30

Ellicott Creek Improvement.

Chapter 824, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edward J. Govern	Division engineer	$400 per month	$12 91	$26 70	$39 61
Edward Anderberg	Assistant engineer	7 00 per day	56 00	44 85	100 85
Burr M. Stark	Leveler	5 00 per day	340 00	69 70	409 70
Walter G. Dubey	Rodman	4 00 per day	88 00	....	88 00
Powell Wall	Rodman	3 50 per day	70 00	....	70 00
Nelson E. Hubbell	Boatman	3 00 per day	135 00	....	135 00
Chas. J. Kennedy	Laborer	2 00 per day	76 00	....	76 00
F. B. Lent	Laborer	2 00 per day	30 00	....	30 00
Emory D. Haley	Laborer	2 00 per day	64 00	....	64 00
Ernest J. Culman	Laborer	2 00 per day	78 00	....	78 00
John Stapleton	Laborer	2 00 per day	30 00	....	30 00
					$1,121 16
Incidental Expenses.					
Stationery and printing				$0 80	
Postage				20	
Office rent				20 00	
Telephone and telegraph				05	
Miscellaneous				21 43	
					42 48
Total					$1,163 64

Bergholtz Creek Improvement.

Chapter 729, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edward J. Govern	Division engineer	$400 per month	$12 90	$21 00	$33 90
O. L. Burdett	Assistant engineer	6 00 per day	96 00	50 10	146 10
John Mockler	Draftsman	4 00 per day	68 00	....	68 00
M. G. Cain	Rodman	4 00 per day	36 00	....	36 00
Lynn H. Barrows	Axeman	2 50 per day	27 50	....	27 50
Wm. F. Guenther	Boatman	3 00 per day	18 00	....	18 00
C. Keunro	Laborer	2 00 per day	20 00	....	20 00
Leo G. Cooley	Laborer	2 00 per day	10 00	....	10 00
Harry E. Rose	Laborer	2 00 per day	18 00	....	18 00
H. B. Riesterer	Laborer	2 00 per day	12 00	....	12 00
					$389 50
Incidental Expenses.					
Miscellaneous				$3 90	
					3 90
Total					$393 40

Surveys for State Board of Claims.

Chapter 811, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
J. V. Hogan	Resident engineer	$250 per month	$8 33	$2 20	$10 53
O. F. Bellows	Resident engineer	225 per month	29 03	31 31	60 34
J. S. Summers	Assistant engineer	7 00 per day	14 00	6 55	20 55
R. H. Merrill	Assistant engineer	6 00 per day	6 00	2 35	8 35
R. H. Merrill	Assistant engineer	7 00 per day	63 00	18 15	81 15
H. R. Wickham	Assistant engineer	6 00 per day	6 00	4 60	10 60
L. G. Fisher	Assistant engineer	6 00 per day	84 00	54 58	138 58
H. H. Stickney, Jr.	Assistant engineer	5 00 per day	50 00	18 30	68 30
Frederick T. Lawton	Assistant engineer	5 00 per day	10 00	5 50	15 50
E. S. Overbaugh	Leveler	5 00 per day	25 00	21 10	46 10
Joseph Bleich	Leveler	4 50 per day	4 50		4 50
Paul A. Volcker	Leveler	4 50 per day	9 00		9 00
H. Clyde Roe	Draftsman	5 00 per day	155 00		155 00
G. M. Colony	Rodman	4 00 per day	24 00	3 98	27 98
John M. Barney	Rodman	3 50 per day	7 00	5 20	12 20
M. A. Danville	Rodman	3 50 per day	31 50		31 50
Frank M. Sisson	Chainman	3 00 per day	9 00	75	9 75
K. R. Schulte	Chainman	2 50 per day	10 00		10 00
Harry Goldman	Chainman	2 50 per day	17 50		17 50
Fred H. Palmer	Foreman of borings	4 00 per day	752 00	93 70	845 70
Wm. Slattery	Laborer	2 00 per day	220 00	64 80	284 80
John F. Carroll	Laborer	2 00 per day	2 00		2 00
Patrick Tracy	Laborer	2 00 per day	32 00	1 60	33 60
Thos. Cleary	Laborer	2 00 per day	36 00	10 80	46 80
F. A. Macomber	Laborer	2 00 per day	228 00	15 90	243 90
J. J. Lynch	Laborer	2 00 per day	248 00	72 00	320 00
Edward McGurn	Laborer	2 00 per day	142 00	29 50	171 50
Martin Hickey	Laborer	2 00 per day	106 00	18 34	124 34
Ira J. Lester	Laborer	2 00 per day	2 00		2 00
M. Munger	Laborer	2 00 per day	2 00		2 00
					$2,814 07
Incidental Expenses.					
Fuel and light				$107 75	
Telephone and telegraph				52	
Miscellaneous				204 80	
					313 07
Total					$3,127 14

Surveys, Field Notes and Manuscript Maps.

Chapter 511, Laws of 1912; Chapter 290, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
L. G. Fisher	Assistant engineer	$6 00 per day	$672 00	$21 26	$693 26
George D. Kellogg	Assistant engineer	6 00 per day	150 00	3 70	153 70
J. T. Bixby	Assistant engineer	6 00 per day	108 00		108 00
H. J. Simmelink	Leveler	5 00 per day	585 00		585 00
Joseph Bleich	Leveler	4 50 per day	85 50		85 50
Jacob Gadlowits	Leveler	4 50 per day	49 50	60	50 10
W. B. Green	Rodman	3 50 per day	311 50		311 50
W. H. Ginnity	Rodman	4 00 per day	208 00		208 00
W. R. Miller	Rodman	3 50 per day	168 00		168 00
W. M. J. Lewis	Rodman	3 50 per day	91 00		91 00
E. J. Maguire	Rodman	3 50 per day	91 00		91 00
W. B. Green	Chainman	3 00 per day	66 00		66 00
W. H. Saunders	Chainman	3 00 per day	33 00	85	33 85
A. F. Truex	Chainman	3 00 per day	222 00		222 00
P. C. Rock	Chainman	2 50 per day	5 00		5 00
W. H. Davis	Chainman	2 50 per day	260 00		260 00
M. H. McConnell	Chainman	2 50 per day	27 50	60	28 10
J. G. Flynn	Chainman	2 50 per day	35 00		35 00

Surveys, Field Notes and Manuscript Maps — (Concluded).

Chapter 511, Laws of 1912; Chapter 290, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
A. B. Chappell	Draftsman	$5 00 per day	$490 00	....	$490 00
John Mockler	Draftsman	4 00 per day	168 00	$47 94	215 94
Chas. R. Zorsch	Draftsman	5 00 per day	345 00	....	345 00
W. J. Burns	Tracer	83 33 per month	312 55	....	312 55
Lynn H. Barrows	Axeman	2 50 per day	100 00	....	100 00
Finla L. Jones	Axeman	2 50 per day	35 00	3 50	38 50
L. Durnherr	Boatman	3 00 per day	39 00	....	39 00
D. M. Bowes	Boatman	3 00 per day	24 00	....	24 00
M. H. McConnell	Boatman	3 00 per day	42 00	....	42 00
John Roekl	Boatman	3 00 per day	24 00	....	24 00
T. F. Moran	Boatman	3 00 per day	312 00	....	312 00
W. T. Burke	Laborer	2 00 per day	26 00	....	26 00
C. R. Kirby	Laborer	2 00 per day	26 00	....	26 00
F. B. Monaghan	Laborer	2 00 per day	26 00	....	26 00
J. P. Lawyer	Laborer	2 00 per day	24 00	....	24 00
J. Hart	Laborer	2 00 per day	12 00	....	12 00
F. J. Madden	Laborer	2 00 per day	104 00	....	104 00
C. Kumro	Laborer	2 00 per day	2 00	....	2 00
M. Cunningham	Laborer	2 00 per day	208 00	....	208 00
E. L. Kelly	Laborer	2 00 per day	208 00	....	208 00
Joseph Carson	Laborer	2 00 per day	208 00	....	208 00
Henry Madden	Laborer	2 00 per day	40 00	8 95	48 95
Roland Westbrook	Laborer	2 00 per day	18 00	2 25	20 25
John F. Carroll	Laborer	2 00 per day	6 00	4 25	10 25
H. I. Ingersoll	Laborer	2 00 per day	158 00	....	158 00
Leo G. Cooley	Laborer	2 00 per day	4 00	....	4 00
Chas. J. Kennedy	Laborer	2 00 per day	54 00	....	54 00
Emory D. Haley	Laborer	2 00 per day	80 00	....	80 00
Ernest J. Culmann	Laborer	2 00 per day	28 00	....	28 00
John Stapleton	Laborer	2 00 per day	80 00	....	80 00
Austin P. Henry	Laborer	2 00 per day	16 00	....	16 00
					$6,481 45
		Incidental Expenses.			
Stationery and printing				$0 10	
Miscellaneous				239 09	
					239 19
Total					$6,720 64

SUMMARY.

The foregoing tables are summarized as follows:

Ordinary Repairs to Canals.

1. Erie canal, chapter 546, Laws of 1912	$9,078 06

Construction of Barge Canal.

2. Erie canal, chapter 147, Laws of 1903, and amendatory laws	272,556 22

Special Work.

3. Chadakoin river improvement, chapter 758, Laws of 1913	1,909 18
4. Chemung river improvement, chapter 732, Laws of 1913	529 23
5. Canisteo river improvement, chapter 750, Laws of 1913	1,622 30
6. Ellicott creek improvement, chapter 824, Laws of 1913	1,163 64
7. Bergholtz creek improvement, chapter 729, Laws of 1913	393 40

Special Surveys.

8. Surveys for Board of Claims, chapter 811, Laws of 1911	3,127 14
9. Surveys, field notes and manuscript maps, chapter 511, Laws of 1912, and chapter 290, Laws of 1913	6,720 64
Total	$297,099 81

TABLE OF CONTRACTS COMPLETED ON THE WESTERN DIVISION DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1913.

Construction of the Barge Canal.

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
Crowell-Sherman-Stalter Co.*	Nov. 30, 1908	Contract No. 47, Erie canal — Town of Galen to Lyons	$1,434,148 00	$829,194 34	$836,850 40
The United Construction Co.	Mar. 1, 1910	Contract No. 75, Erie canal — Guard-gate superstructures near Spencerport, Brockport and Middleport	39,525 00	42,917 00	41,027 73
John Young	April 24, 1913	Contract No. 112, Erie canal — Steel sheet-piling on contracts Nos. 60 and 66	130,500 00	120,350 00	120,519 32

* Contract terminated by the Canal Board; resolution dated June 11, 1913.

Special Work Connected with Barge Canal Construction.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price.	Final payment.
Crowell-Sherman-Stalter Co.	Aug. 14, 1912	Agreement — Construction of a highway on north side of canal between Stas. 6738 and 6752, adjacent to contract No. 48	$4,522 60	$4,522 60	$3,624 42
The T. A. Gillespie Co.	April 25, 1912 and Nov. 21, 1912	Agreement — Construction of a highway between Peek's bridge and Port Gibson; a highway between Stas. 6973 and 6980, and between Stas. 7177 and 7185, all on south side of canal, adjacent to contracts Nos. 76 and 77	23,088 78	23,088 78	22,909 04
H. S. Kerbaugh, Inc.	Nov. 13, 1912	Agreement — Construction of a highway near Bushnells Basin, adjacent to contract No. 63	1,324 48	1,324 48	1,324 48

Empire Engineering Corporation	May 14. 1912	Agreement — Construction of highways between Stas. 3300 +15 and 3309 +05, Stas. 3401 +20 and 3407 +80, Stas. 3408 +50 and 3422 +86, and Stas. 3457 +05 and 3460 +30, all on north side of canal, adjacent to contract No. 60	1,902 34	1,902 34	1,899 14
Cleveland & Sons Co	Jan. 31, 1911	Agreement — Construction of a highway along south side of canal at various places between Stas. 3574 and 3843, adjacent to contract No. 61	7,267 70	7,267 70	6,957 38
Cleveland & Sons Co	Oct. 11, 1910	Agreement — Construction of a highway connecting bridges 105 and 106, on north side of canal, adjacent to contract No. 61	3,987 10	3,987 10	3,315 63
Empire Engineering Corporation	....	Agreement — Construction of a highway around north approach to Young's bridge, adjacent to contract No. 66	2,069 00	2,069 00	2,099 88

TABLE OF CONTRACTS PENDING ON THE WESTERN DIVISION, SEPTEMBER 30, 1913.

Construction of the Barge Canal.

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1913.
Great Lakes Construction Co	Nov. 26, 1906	Contract No. 19, Erie canal — Sulphur Springs guard-lock to Ellicott creek	$1,038,245 00	$891,400 91	$781,440 00
Lane Brothers Co	April 7, 1910	Contract No. 21, Erie canal — Genesee river to near N. Y. C. & H. R. R. R. bridge	1,475,900 00	1,320,103 68	936,150 00
Millard & Lupton Co	Aug. 18, 1909	Contract No. 23, Erie canal — Kings Bend to Genesee river	2,166,600 00	1,824,388 60	1,181,410 00
The United Engineering&Contracting Co.	Nov. 27, 1908	Contract No. 40, Erie canal — Locks at Lockport to Sulphur Springs guard-lock	2,516,743 00	2,237,255 66	2,086,100 00
Crowell-Sherman-Stalter Co	Dec. 29, 1910	Contract No. 48, Erie canal — Near N. Y. C. & H. R. R. R. crossing at Lyons to near West Shore R. R. crossing at East Newark	1,626,811 50	1,679,265 95	1,231,910 00
American Pipe & Construction Co	Feb. 21, 1910	Contract No. 49, Erie canal — Palmyra to Wayne-Monroe county line	765,679 00	735,279 75	644,180 00

TABLE OF CONTRACTS PENDING ON THE WESTERN DIVISION, SEPTEMER 30, 1913 — (*Concluded*).

Construction of the Barge Canal — (Concluded).

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1913.
Empire Engineering Corporation	Aug. 6, 1908	Contract No. 60, Erie canal — Near South Greece to near Adams Basin	$1,267,301 00	$1,484,803 42	$1,308,740 00
Cleveland & Sons Co	Oct. 13, 1908	Contract No. 61, Erie canal — Near Adams Basin to Monroe-Orleans county line	1,006,219 00	1,180,853 35	1,014,710 00
I. M. Ludington's Sons, Inc	Aug. 11, 1910	Contract No. 62, Erie canal — Monroe-Orleans county line to Eagle Harbor	2,151,470 00	2,662,644 59	2,649,500 00
H. S. Kerbaugh, Inc	June 3, 1910	Contract No. 63, Erie canal — Wayne-Monroe county line to Kings Bend	2,184,083 00	2,661,377 06	2,279,160 00
Empire Engineering Corporation	Aug. 6, 1908	Contract No. 64, Erie canal — Near Prospect street, Medina, to near Gasport	1,207,930 00	1,339,265 78	1,053,740 00
Maryland Dredging & Contracting Co.	Mar. 26, 1913	Contract No. 65, Erie canal — Contract No. 9 to near Prospect street, Medina	1,131,523 00	1,000,098 45	226,810 00
Empire Engineering Corporation	Sept. 22, 1908	Contract No. 66, Erie canal — Near Gasport to near locks at Lockport	751,039 00	852,804 61	773,890 00
Larkin & Sangster	Sept. 3, 1910	Contract No. 67, Erie canal — Locks at Lockport	1,290,880 00	1,181,727 86	1,001,200 00
The T. A. Gillespie Co	Dec. 23, 1910	Contract No. 76, Erie canal — Near West Shore R. R. crossing at East Newark to about one-half mile east of Port Gibson	1,504,776 00	1,491,880 10	1,367,470 00
The T. A. Gillespie Co	Dec. 23, 1910	Contract No. 77, Erie canal — About one-half mile east of Port Gibson to about one-half mile west of Palmyra	1,790,672 50	1,701,807 55	1,562,020 00
Groton Bridge Co	Dec. 7, 1910	Contract No. 82, Erie canal — Highway bridge superstructures within the limits of contract No. 21	27,235 00	28,841 50	21,320 00
Owego Bridge Co	May 28, 1912	Contract No. 89, Erie canal — Highway bridges between Lyons and Palmyra	65,116 00	59,616 00	18,630 00
MacArthur Bros. Co. & Lord Electric Co.	Feb. 17, 1913	Contract No. 94, Erie canal — Power-plants, electrical equipment, etc., for the locks on the Western Division	461,300 00	433,380 90	22,330 00
Skene & Richmond	April 19, 1912	Contract No. 105, Erie canal — Five lift-bridges, from Spencerport to Gasport	253,010 00	259,355 00	246,640 00
Wm. J. Dowdle	April 15, 1913	Contract No. 113, Erie canal — Furnishing and delivering lumber and wooden piles at Bushnell's Basin and Holley	26,452 00	21,964 00	20,770 00

Special Work Connected with Barge Canal Construction.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price.	Value of work done to September 30, 1913.
The T. A. Gillespie Co.	Nov. 21, 1912	Agreement — Construction of 2,400 lin. ft. of wooden fence along highways in vicinity of Port Gibson, adjacent to contracts Nos. 76 and 77	$720 00	$720 00	*
The T. A. Gillespie Co.	June 8, 1911	Agreement — Construction of a highway on north side of canal, adjacent to contract No. 76	1,699 00	1,699 00	*
H. S. Kerbaugh, Inc.	Jan. 14, 1913	Agreement — Construction of a highway on west side of N. Y. C. R. R. at Cartersville, adjacent to contract No. 63	3,765 00	3,765 00	*
Cleveland & Sons Co.	April 11, 1913	Agreement — Construction of a highway between bridges 111 and 112, on north side of canal, adjacent to contract No. 61	3,612 80	3,612 80	*
Great Lakes Construction Co.	Jan. 16, 1913	Agreement — Construction of a highway designated "Road L," on north side of canal, adjacent to contract No. 19	2,898 65	2,898 65	*
Larkin & Sangster	Aug. 24, 1912	Agreement — Construction of a highway from the hollow up the hill between the hydraulic race and the street, adjacent to contract No. 67	3,358 00	3,358 00	$2,626 65

* Completed; final estimate being prepared.

REPORT

OF THE

TERMINAL ENGINEER

ON

BARGE CANAL TERMINALS

For the Fiscal Year Ended September 30, 1913

TERMINAL ENGINEER'S REPORT.

State of New York,
Department of State Engineer and Surveyor,
Barge Canal Terminals,
Terminal Engineer's Office.

Albany, *October* 1, 1913.

Hon. J. A. Bensel, *State Engineer and Surveyor, Albany, N. Y.:*

Sir.— I have the honor to submit herewith my annual report as Terminal Engineer for the fiscal year ended September 30, 1913.

During the past year the organization and the handling of the work in this bureau has been the same as outlined in my last annual report. The engineering force, however, has been increased, owing to the numerous construction contracts on which active operations have been in progress during the past season.

Since my last report contract plans have been completed for walls, piers, excavation, etc., in connection with terminals at Troy, Erie basin (Buffalo), Fort Plain, Plattsburg, Port Henry, Frankfort, Oswego and Watkins. In addition, preliminary surveys and tentative studies for terminals at several other localities have been in progress.

During the year work has been put under contract in connection with the terminals at Whitehall, Fonda, Ilion, Amsterdam, Utica, Rome, Lockport, Fort Plain, Plattsburg, Port Henry and Frankfort.

A tabular statement of all contracts awarded to date follows:

Terminal Contract No.	Location.	Name of contractor.	Engineer's estimate.	Contract price.	Contract price as affected by alterations.
1	Ithaca	N. Y. State Dredging Corporation	$43,781 00	$46,464 00	$46,464 00
2	Albany	Raymond Concrete Pile Co	132,993 00	141,362 00	141,362 00
3	Little Falls	Aetna Engr'g & Cont'g Co	56,250 00	58,361 75	58,361 75
5	Mechanicville	E. Brown Baker	47,711 00	55,634 00	55,634 00
6	Whitehall	Albert M. Banker	36,714 00	38,901 25	38,901 25
7	Fort Edward	Aldrich & Hall, Inc	37,924 00	39,309 00	39,309 00
7-A	Fort Edward	N. Y. State Dredging Corporation	115,060 00	109,332 00	109,332 00
8	Schenectady	American Pipe & Const'n Co	152,630 00	166,971 00	166,752 00
9	Herkimer	Aetna Engr'g & Cont'g Co	68,262 00	73,882 00	73,882 00
10	Fonda	American Pipe & Const'n Co	58,248 00	63,514 00	63,514 00
11	Ilion	Aetna Engr'g & Cont'g Co	57,944 00	55,880 00	55,880 00
12	Amsterdam	American Pipe & Const'n Co	64,765 00	66,361 70	66,361 70
15	Utica	Albert M. Banker	608,071 00	557,104 50	549,118 00
16	Rome	M. A. Talbott Co	91,247 00	91,954 00	91,954 00
17	Lockport	John Johnson Const'n Co	55,605 00	48,448 50	48,448 50
22	Fort Plain	Leary & Morrison Co	24,872 00	26,860 50	26,860 50
23	Plattsburg	D. L. Taylor & Co	136,143 00	126,834 60	126,499 60
25	Port Henry	N. Y. State Dredging Corporation	51,307 00	53,633 00	53,633 00
27	Frankfort	Aetna Engr'g & Cont'g Co	37,797 00	39,875 00	39,875 00
		Totals	$1,877,324 00	$1,860,682 80	$1,852,142 30

In addition to the above-mentioned contracts, plans and specifications have been completed for work as follows:

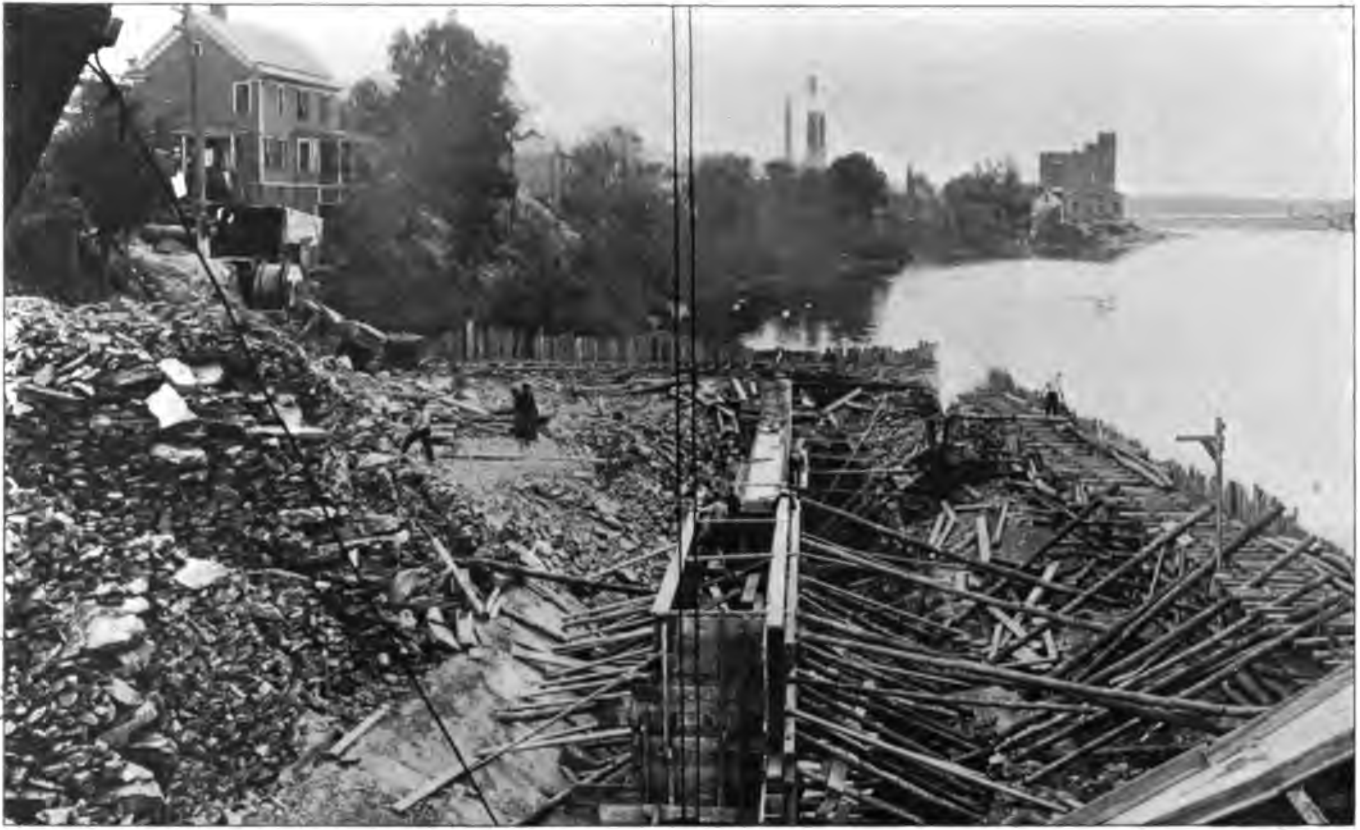
Terminal contract No.	Location.	Engineer's estimate.
4	Gowanus bay	$128,633
14	Troy	152,291
21	Erie basin (Buffalo)	1,513,925
30	Oswego	119,004
32	Watkins	31,102

Up to the end of the fiscal year the Canal Board, aside from the places before enumerated, has approved locations for terminals at the following places: Varick, Waterford, St. Johnsville, Cohoes and Ohio basin (Buffalo).

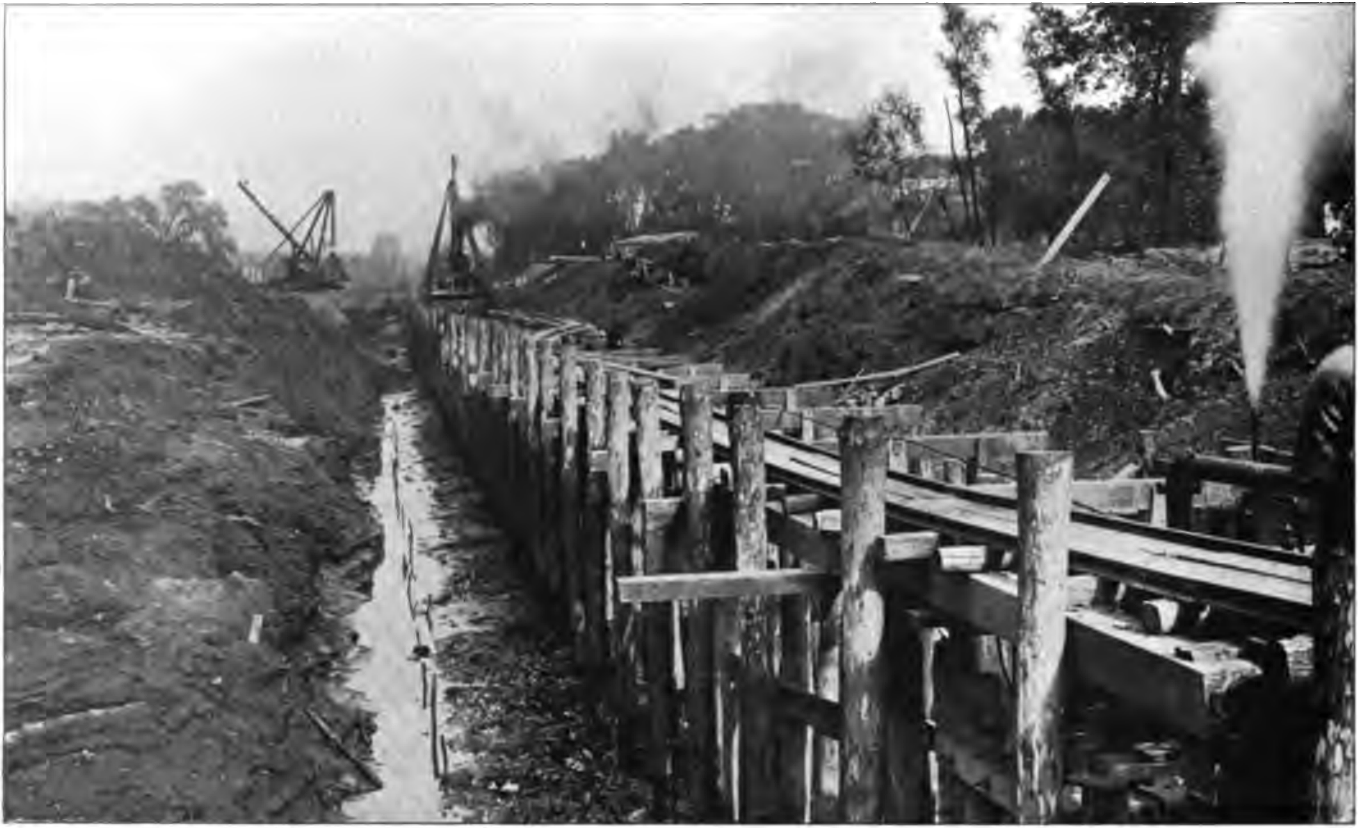
Terminal contracts which have been let and are prepared for letting cover the construction of dockwalls and approaches and the dredging of harbors. In many instances the work is far advanced and contracts are nearing completion.

SOUTHERN DIVISION.

Work on the Southern Division has been under the charge of Terminal Division Engineer Carleton Greene. Mr. Greene reports progress on the sites of the various terminals as follows:



Barge Canal, Terminal Contract No. 5 — Mechanicville.
View showing concrete forms and completed section of dockwall.



BARGE CANAL, TERMINAL CONTRACT NO. 8 — SCHENECTADY.
Pile foundation for the dockwall — wooden piles to support the concrete floor, on which will rest dockwall and part of backfill.

UNIV. OF MICH.

Port of Call, Dyckman Street.

Plans and studies have been made to fit the plans proposed by the Board of Estimate. Surveys and investigations have been made for a possible change of location of the Port of Call to a point north of the Harlem Ship canal.

Bronx Terminals.

Complete investigations have been made, including surveys, wash borings and soundings to determine location of rock at sites proposed for terminals on Bronx river and Eastchester creek.

Greenpoint.

Surveys, wash borings, studies, plans and specifications have been made and test piles driven for dredging, moving concrete factory, new pier, etc., for the terminal at this point. Levels at this point have been connected with those of United States Coast Survey. Studies have been made for freight-handling machinery in connection with the terminal.

Gowanus Bay.

Surveys and wash borings have been completed and test piles driven. An extensive study of large concrete piles for the bulkhead wall has been made. Studies and estimates for various types of bulkhead wall have been made. Studies and estimates for various types of bulkhead wall have been completed. Plans, specifications for dredging, filling, extension to Hicks street sewer and bulkhead walls have been made. A large amount of data was collected for the use of the Attorney-General in the claims of the Beard and Poillon estates.

EASTERN DIVISION.

Construction on the Eastern Division has been under the direct supervision of the Terminal Engineer, assisted by Resident Engineer H. O. Schermerhorn. On this Division construction is in progress at Plattsburg, Whitehall, Fort Edward and Mechanicville on the Champlain canal; and at Albany, Schenectady, Amsterdam, Fonda, Fort Plain, Little Falls, Herkimer, Ilion and Frankfort on the Erie canal. Terminals under contract at

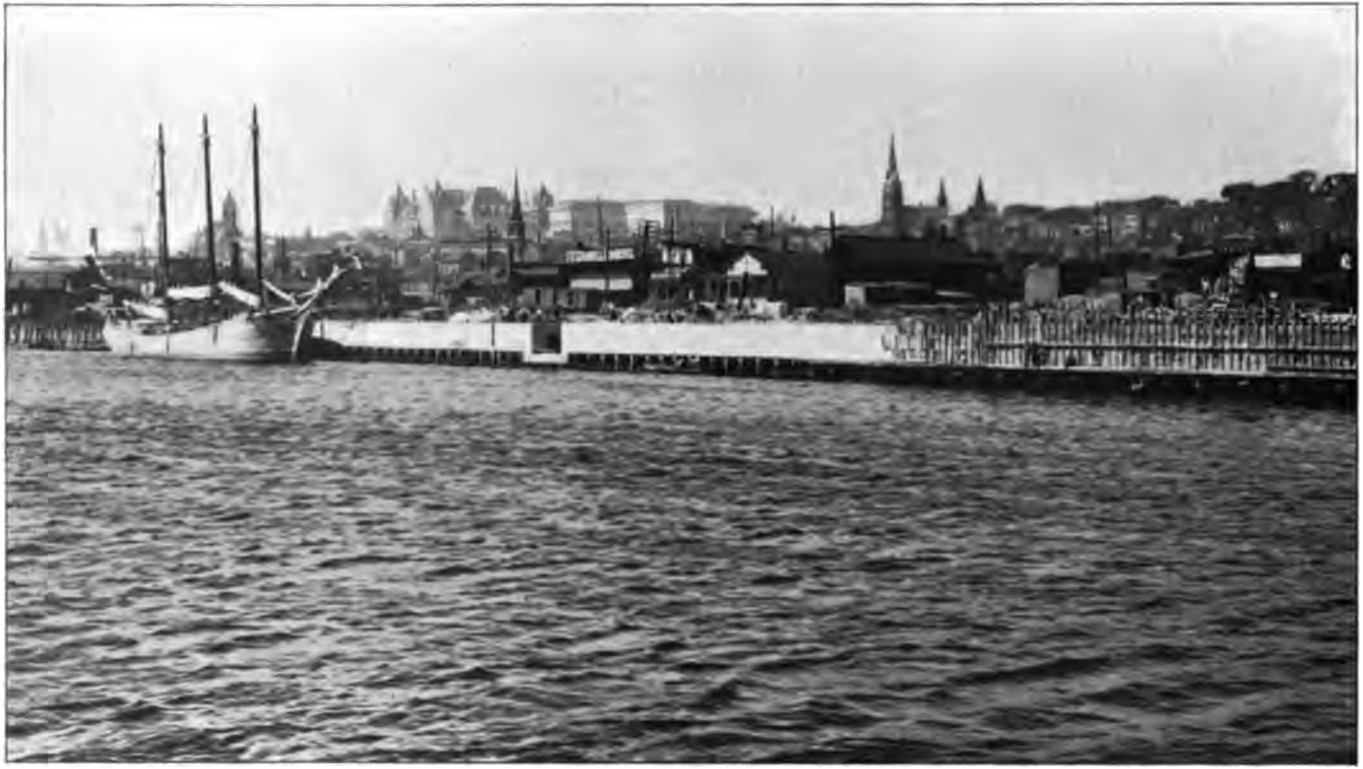
Fort Edward, Mechanicville, Albany, Little Falls and Ilion are more than 50 per cent completed.

Terminal Contract No. 2 — Albany.

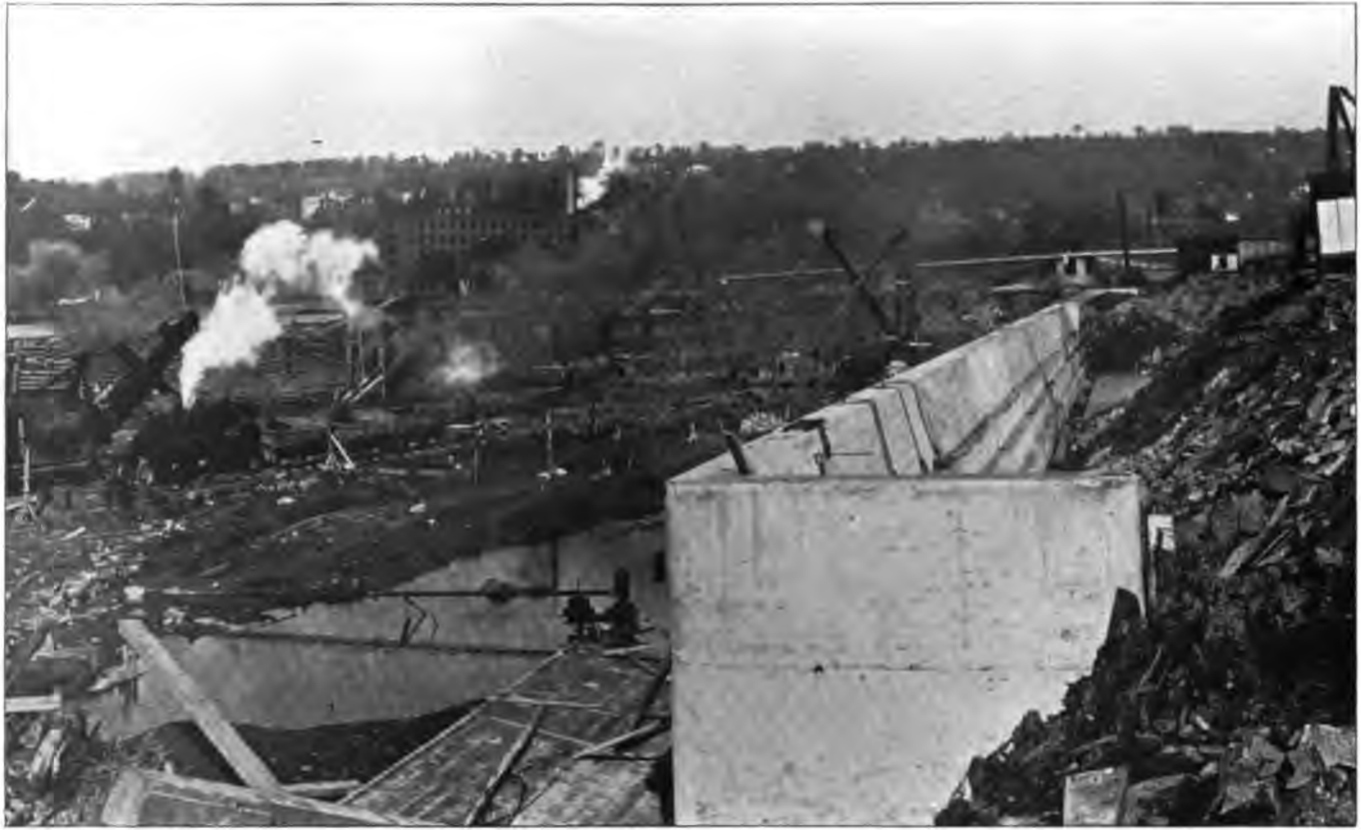
The construction on this contract is in charge of A. C. Richards, Assistant Engineer. The site of the Albany terminal is in the lumber district and runs from North Ferry street northerly 1,560 feet. The dockwall is to be 1,510 feet long and will consist of a girder wall 8 feet high, supported on a row of concrete sheet-piles interlocked and a row of square piles 18 inches in front of the sheet-piles, spread 6½ feet center to center. The wall is connected by means of reinforced concrete ties to anchorages supported on two anchor piles each. The anchors are behind the old dockwall and at an average distance of 45 feet from the new wall. These ties are 20 feet, center to center. All concrete work is heavily reinforced.

The contract for constructing the terminal at Albany was let to the Raymond Concrete Pile Company of New York on August 30, 1912. Work was commenced in October, 1912, and the contractor completed the driving of the anchor piles and placed the concrete anchorages and portions of the ties behind the old dockwall during the fall and early winter, closing down construction work in December. The work was resumed in April, 1913, and preparations were immediately made for casting the reinforced concrete sheet and square piles. This work was completed the latter part of August, 1913. Pile driving was begun in June, 1913, and to date has been completed for a distance of 1,175 feet. The driving has run from easy to very hard. Numerous boulders, interfering in one place, necessitated dredging before piles could be placed. All piles were driven from a floating plant, using a 6,000-pound hammer.

The concrete girder wall, supported on the piles, is completed to Sta. 6 + 90. The work is being rapidly pushed on the remainder of the wall. Sheet-piles which strike rock at an elevation greater than –20 are to be anchored to the rock. Attempts have been made to drill the rock for these anchorages by operating the drill through holes left in the sheet-piles for that purpose. These attempts have not been successful. Work has not been abandoned, however, and new methods will be devised.



BARGE CANAL, TERMINAL CONTRACT NO. 2 — ALBANY.
General view of partially completed dockwall, which is supported on reinforced concrete piles. Also a schooner unloading cargo is seen.



BARGE CANAL, TERMINAL CONTRACT NO. 3 — LITTLE FALLS.
Partially completed dockwall. View shows also coffer-dam constructed so as to allow harbor excavation by dry methods.

IV. OF MICH.

The track of the D. & H. R. R., which ran through the terminal site, was removed to a new location 125 feet from the face of the new dockwall. The telephone line, water hydrants and horse-car line have been removed from the right of way. The finished portion of the dock has already been used to unload cargoes of lumber and brick.

Terminal Contract No. 3 — *Little Falls.*

This contract provides for the construction of a harbor and a concrete dockwall on the south side of the Mohawk river, about 800 feet west of the Hausen avenue bridge at Little Falls. This contract was awarded to the Aetna Engineering and Contracting Co. of Herkimer, N. Y., on August 13, 1912. Construction work is in charge of H. J. Stabile, Leveler.

The work of removing rock spoil from the site of the wall was begun in the latter part of October, 1912. In November the hydraulic dredge *General Herkimer* started to excavate material within the limits of the harbor. Early in the spring of 1913 a coffer-dam was constructed, inclosing the rock excavation in both terminal harbor and the Barge canal channel in front of the terminal. About August 1 the contractor began to place concrete in the dockwall. All concrete was mixed with a rotary cube mixer, located 200 feet from the forms. About 3,000 cubic yards of concrete were placed during the months of August and September and a total of 20,000 cubic yards of material has been excavated to date. All parts of the work are well under way and, with suitable weather conditions, construction should be completed by January 1, 1914.

Terminal Contract No. 5 — *Mechanicville.*

Under this contract a harbor and dockwall are to be constructed on the west side of the Hudson river at River street, Mechanicville. The contract was awarded to E. Brown Baker of Herkimer, N. Y., on September 4, 1912. J. E. Hall, Assistant Engineer, is in charge of construction.

An earth-filled coffer-dam, 650 feet in length, constructed with round timbers, sheeted on both sides, was built around the entire site of the dockwall. Actual construction work was begun in

August, 1913. By the end of the fiscal year sufficient rock had been excavated from the cut to allow the construction of 170 linear feet of dockwall, 135 feet of which has been completed, in addition to the return wall at the north end. The site of the work was kept unwatered by the operation of one 6-inch pump. All drilling was done by one tripod drill, and the excavated material was removed from the cut in buckets by a stiff-legged derrick and spoiled temporarily in the rear of the wall, until such time as the material may be needed for backfill. The concrete was deposited in the forms from bottom dump cars, running along a track laid on an overhead trestle, the concrete reaching the forms through steel chutes. Sixteen per cent of the construction work on this contract has been completed.

Terminal Contract No. 6 — Whitehall.

This contract provides for the construction of a harbor and dockwall on the west side of the Champlain canal, south of Saunders street bridge, Whitehall. The contract was awarded to A. M. Banker of Gloversville, N. Y. Assistant Engineer F. B. Holmes has been in charge of the work for the State.

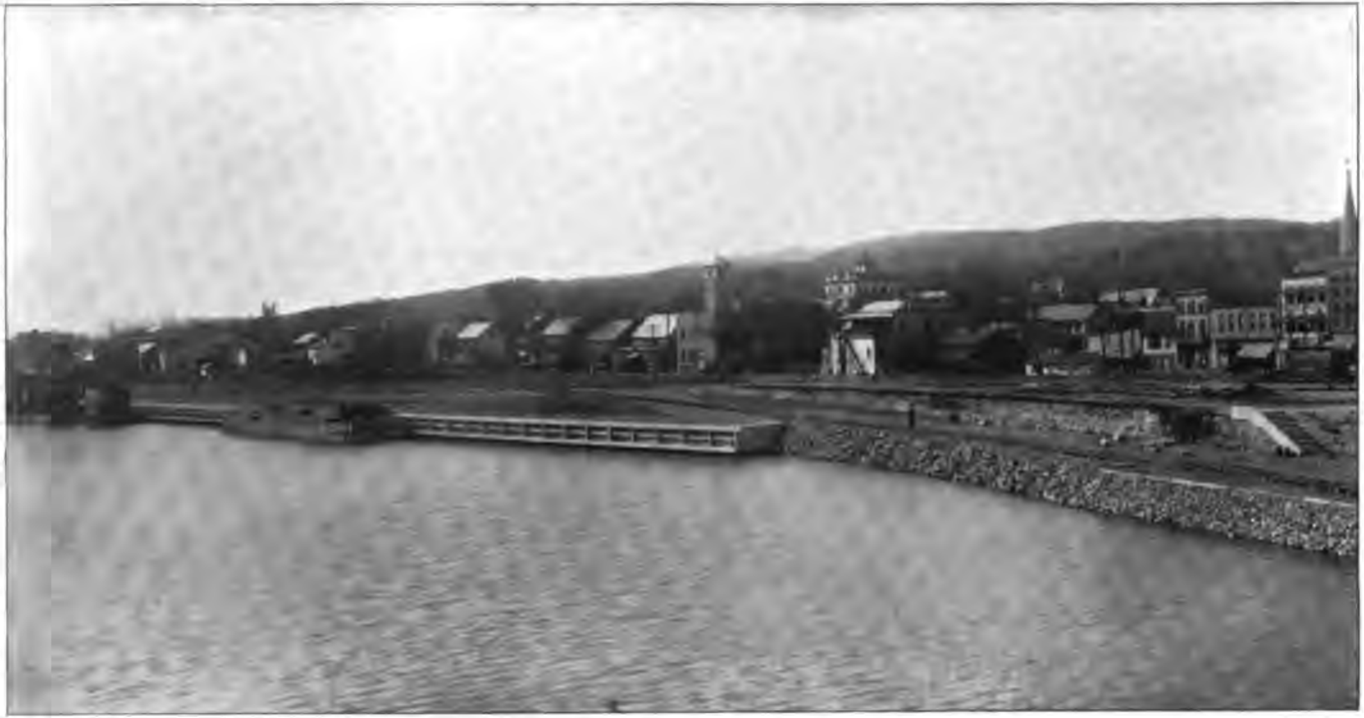
The contractor began active operations in November, 1912, and during that month completed all harbor excavation except rock. On April 15, 1913, a drill boat, a floating derrick, a floating pile driver and a dipper dredge arrived on the site of the work. With this plant work was pushed with all possible speed.

The bottom encountered in driving piles was found to be so soft as to necessitate additional excavation and riprap. An alteration to cover this additional expense has been prepared.

At the north end rock was encountered so near the surface as to preclude pile driving, thus shortening the dockwall 55 feet. The body of the wall was built in thirty sections, the concrete work being completed during August of this year. Ninety-one per cent of this contract has been completed to date. There is no doubt whatever that all construction work will be completed before the expiration of the time limit, November 1, 1913.

Terminal Contracts Nos. 7 and 7-A — Fort Edward.

Terminal contracts Nos. 7 and 7-A provide for the construction of a dockwall on the north bank of the Hudson river and for the



Barge Canal, Terminal Contract No. 6 — Whitehall.
General view of Whitehall and its finished terminal dock.

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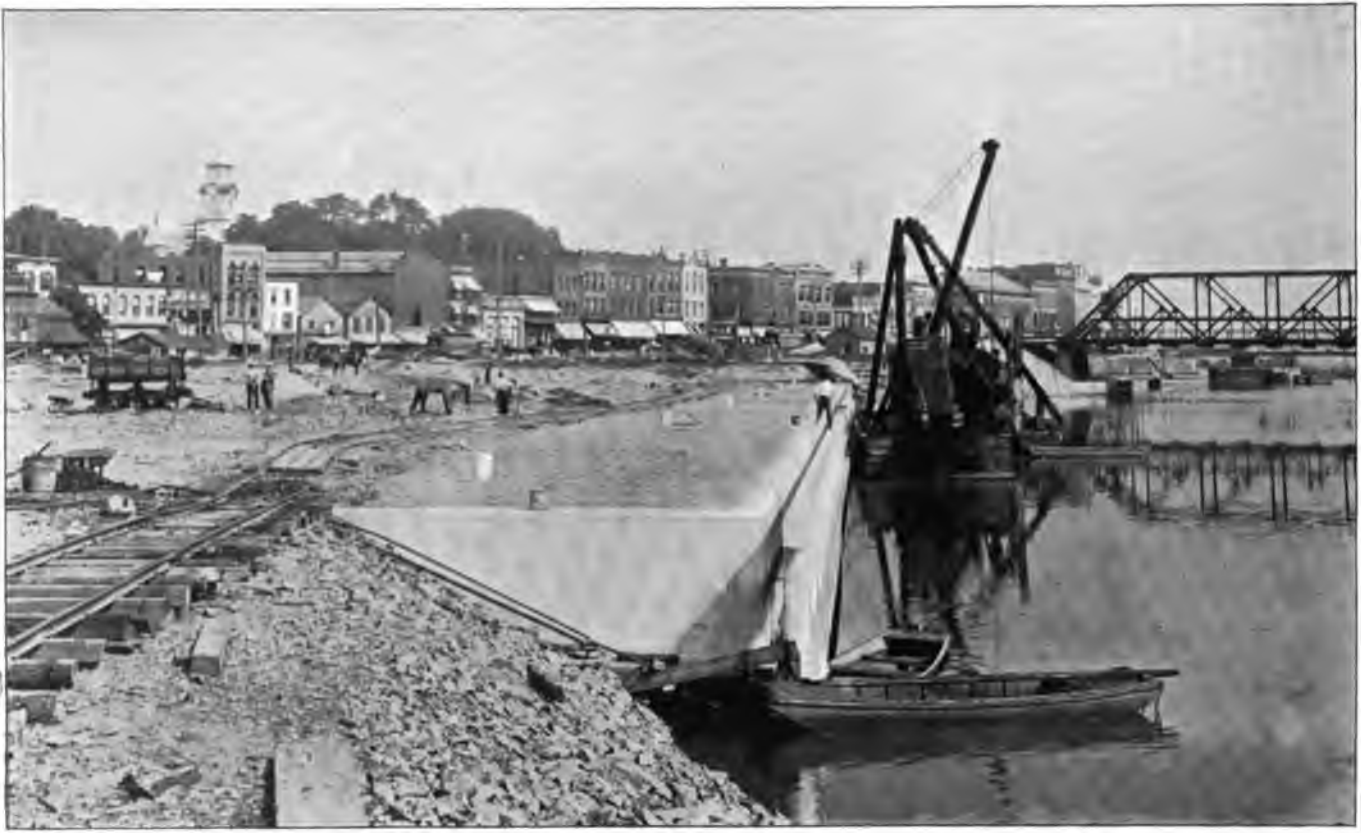

Barge Canal, Terminal Contract No 6 — Whitehall.
View showing completion of concrete wall and fender system, and progress in grading.

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dredging of a harbor near the foot of Eddy street, Fort Edward, respectively. Contract No. 7-A includes also the dredging of a connecting channel with the Barge canal near lock No. 2. Assistant Engineer W. C. Bratton is in charge of construction work of these contracts.

Contract No. 7 was awarded to Aldrich & Hall, Inc., October 3, 1912. Excavation was started at the easterly end of the proposed wall on June 20, 1913, by means of a traveling derrick and clam-shell bucket. At the present time a channel 500 feet long has been excavated for the crib foundation of the wall. Three sections of crib, with a total length of 280 feet, have been completed, sunk into position and filled with stone.

Contract No. 7-A was let to the New York State Dredging Corporation of Rochester, N. Y., on October 14, 1912. Excavation was started on June 18, 1913, by means of a tower excavator and derrick boat. A tower excavator with drag-bucket started to excavate the channel at the D. & H. Railroad bridge and continued easterly to Sta. 14 + 00, removing 41,400 cubic yards of material. The derrick boat with orange-peel bucket started to work west of the highway bridge and excavated portions of the channel and the harbor between Stas. 41 + 50 and 53 + 00, removing 41,000 cubic yards of material. Excavation was started between the railroad and highway bridges on August 16, by means of a traveling derrick with Page bucket, which removed 8,700 cubic yards of material from the channel between Stas. 37 + 50 and 41 + 00. At the present time 63 per cent of the work on this contract has been completed.

Terminal Contract No. 8 — *Schenectady.*

This contract provides for the construction of a harbor and dockwall, situated on the Binne kill between State and Fuller streets, Schenectady. The American Pipe and Construction Co. of Philadelphia, Pa., are the contractors. Assistant Engineer W. A. Treadwell is in charge of the contract. A concrete platform resting on a wooden pile foundation will support a 5-foot concrete dockwall, 1,078 feet in length.

Actual construction work was begun in July, 1913, when foundation piles were driven in the Binne kill at the south end of the proposed terminal. These piles were capped, forming a bridge, which the contractors used in transporting material to the work. A trench has been excavated along the line of the wall, a pump installed and the pile driving continued. The riprapping of the slopes has followed the driving of piles. Ice breakers have been constructed and filled with rock. Ten per cent of the work on this contract has been completed to date.

Terminal Contract No. 9 — *Herkimer.*

This contract provides for the construction of a Barge canal terminal on the north side of the Mohawk river just west of the highway bridge at Herkimer. The contract was awarded on October 2, 1912, to the Aetna Engineering and Contracting Co. The contractors' plant was erected and the excavation for the wall was begun about the middle of October, 1912. The contractor began to place concrete in the wall in May, 1913, completing the concrete work the latter part of August. The wall was backfilled by means of a clam-shell bucket to elevation 363.0. The contractors' plant was dismantled and removed from the work in September. No more work will be done on this contract until a dredge can be obtained to make the harbor excavation. H. J. Stabile, Leveler, is in charge of this contract.

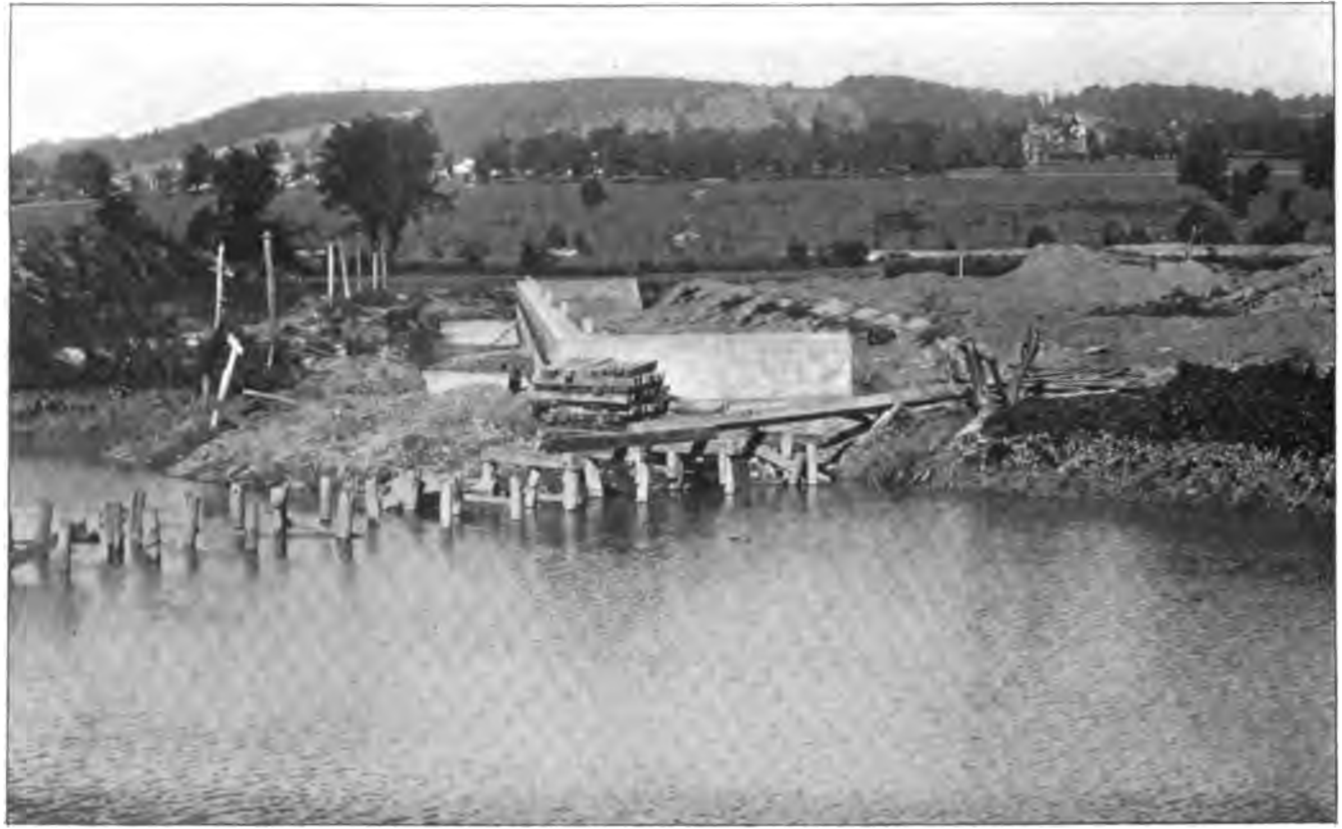
Terminal Contract No. 10 — *Fonda.*

The Barge canal terminal at Fonda is being constructed under terminal contract No. 10, by the American Pipe and Construction Co. of Philadelphia, Pa. This work is under the direction of Assistant Engineer C. R. DeGraff. The contract was let on November 25, 1912.

Active operations were begun in May, 1913. The dockwall is a retaining wall of the gravity type, resting upon a subgrade, a suitable foundation having been encountered, making the use of piles unnecessary. Seventy-five per cent of the dockwall has been completed to date. Two thousand six hundred cubic yards of material have been excavated. This completes 47 per cent of the work on this contract.

Terminal Contract No. 11 — *Ilion.*

The construction of a harbor and concrete dockwall on the south side of the Mohawk river, just west of the highway bridge at



BARGE CANAL, TERMINAL CONTRACT NO. 9 — HERKIMER.
General view of the completed dockwall, which must be backfilled and the site graded. A basin will be dredged in front.

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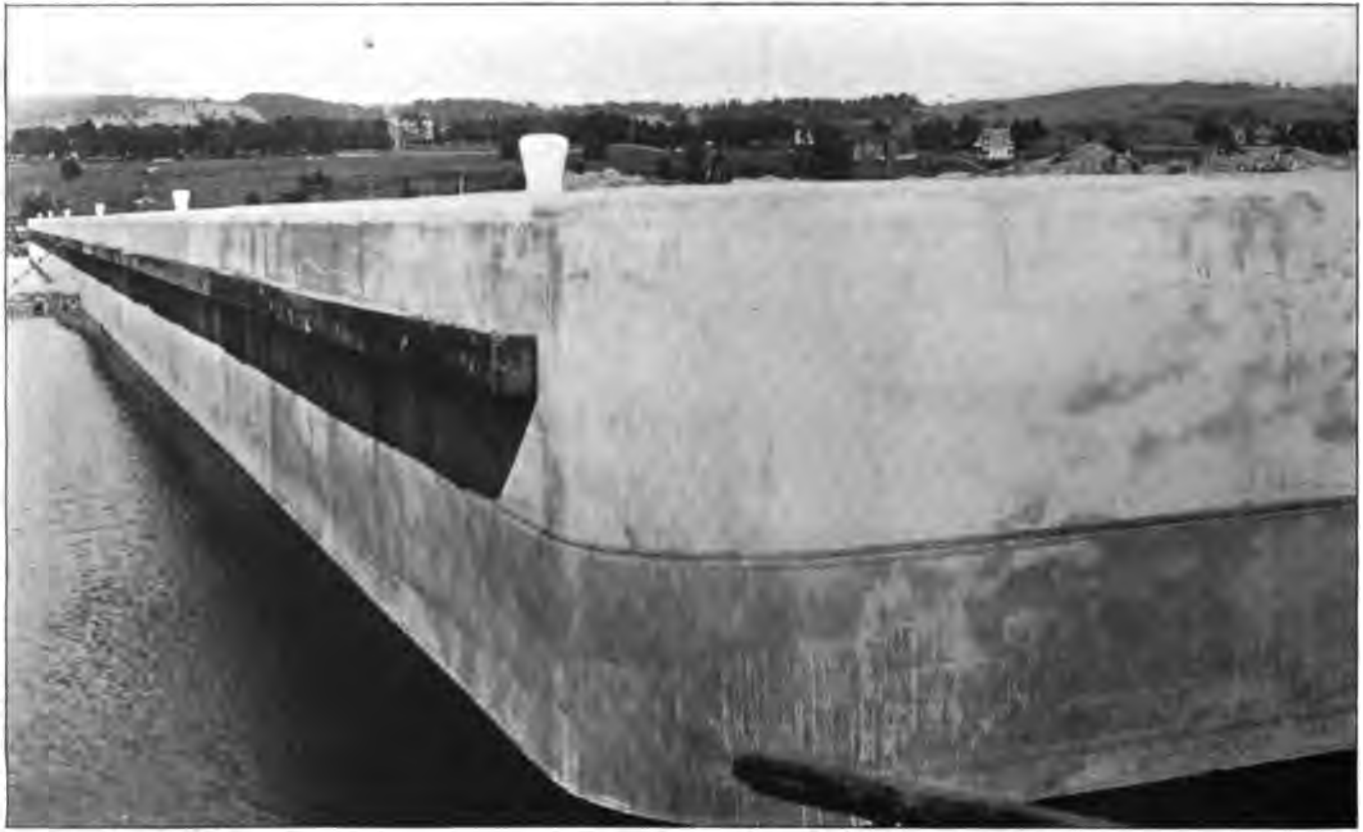

BARGE CANAL, TERMINAL CONTRACT NO. 9 — HERKIMER.
Near-by view of the completed dockwall, showing fender timbers and snubbing posts in place.

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Ilion, is provided for under terminal contract No. 11, awarded to the Aetna Engineering and Contracting Co., Herkimer, N. Y., on November 25, 1912. This contract is in charge of H. J. Stabile, Leveler.

Construction work was begun on March 24, 1912. Material was excavated at the site of the dockwall to elevation 369.0. Test piles were driven to determine the number and length of piles required for the foundation. Concrete work was begun in June. Two thousand seven hundred cubic yards of concrete have been placed and 13,000 cubic yards of material have been excavated to date. About 7,500 linear feet of foundation piles have been driven.

All work is well under way and unless unforseen obstacles arise contract work should be completed early in the season of 1914.

Terminal Contract No. 12 — *Amsterdam.*

This contract provides for the construction of a harbor and concrete dockwall on rock-filled cribs on the northerly side of the Mohawk river at Amsterdam. This contract was awarded to the American Pipe and Construction Co. of Philadelphia, Pa., on November 25, 1912. Assistant Engineer C. R. DeGraff is in charge of this work.

Clearing of the site of the work was begun in July, 1913. By the end of September excavation had been made for 350 feet of the proposed 600-feet dockwall. Stone to be used in filling cribs is quarried on the site of the work. One section of crib, 80 feet long, has been constructed and sunk in place. Ten per cent of the work on this contract has been completed.

Terminal Contract No. 22 — *Fort Plain.*

The construction of a terminal at Fort Plain is provided for under terminal contract No. 22, awarded to Leary and Morrison Co., Fairport, N. Y. This work is in charge of Assistant Engineer C. R. DeGraff, and provides for the construction of a harbor and a concrete dockwall, supported by a stone-filled crib 304 feet in length.

The excavation for the dockwall was begun in the latter part of July, 1913, and by the end of September 1,500 cubic yards of material had been removed and placed in spoil bank. A coffer-dam 330 feet in length is in process of construction and is 90 per cent completed. Two 40-foot sections of crib have been completed with the exception of the placing of the top flooring. Six per cent of the work to be done under this contract has been completed.

Terminal Contract No. 23 — *Plattsburg.*

The terminal at Plattsburg is located at the north end of Cumberland bay in Lake Champlain. This contract was awarded to D. L. Taylor & Co. of Utica, N. Y., and is in charge of Assistant Engineer W. H. Dernell. This work consists of building a dock 200 feet wide and 440 feet long around three sides of an existing pier, and the construction of a breakwater 200 feet south of and extending 200 feet beyond the end of the dock. The dockwall rests upon sunken cribs.

The contractor arrived at the site of the work early in June, 1913, and by the end of the same month the entire plant was in operation, excepting the dredging outfit. Since June 15, 1913, when actual construction was begun, 19 per cent of the work provided for under this contract has been completed.

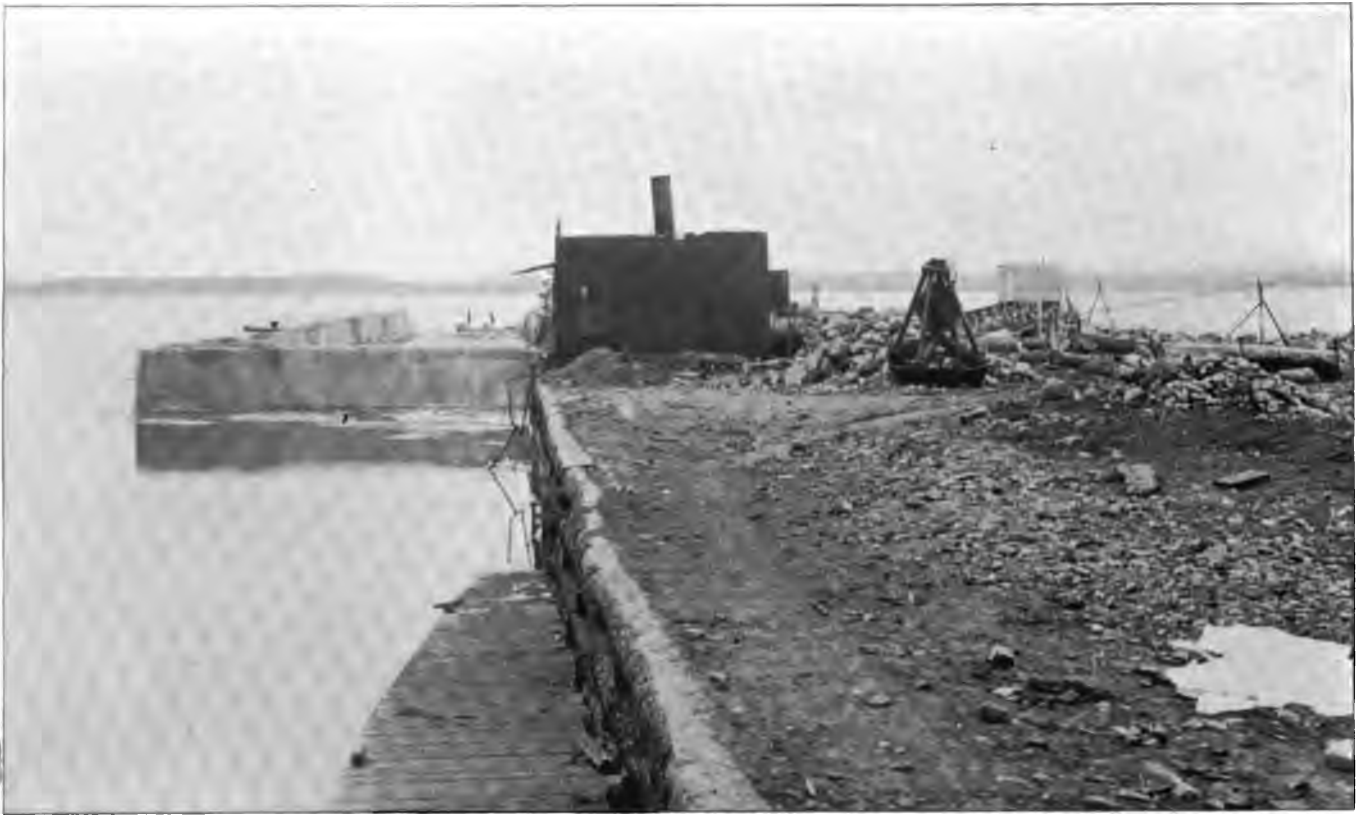
Terminal Contract No. 27 — *Frankfort.*

This contract provides for the construction of a concrete dockwall and a connecting channel in the Mohawk river just west of Schuyler road at Frankfort. The contract was awarded on August 27, 1913, to the Aetna Engineering and Contracting Co. of Herkimer, N. Y.

The hydraulic dredge *Dewitt Clinton* began the excavation of the channel on September 10 and the dredging was completed on the 19th of the same month. About 60,000 cubic yards of material have been excavated. Preparations are being made to complete all of the foundation work before shutting down for the cold weather.

The length of foundation piles required was determined by driving test piles every 50 feet along the line of the face of the proposed dockwall. The contractor has begun to erect his plant for driving foundation piles.

Construction work on this contract is in charge of H. J. Stabile, Leveler. Forty-nine per cent of the work has been completed.



BARGE CANAL, TERMINAL CONTRACT NO. 23 — PLATTSBURG.
View showing old pier in the foreground, beyond which the new concrete dockwall is seen.

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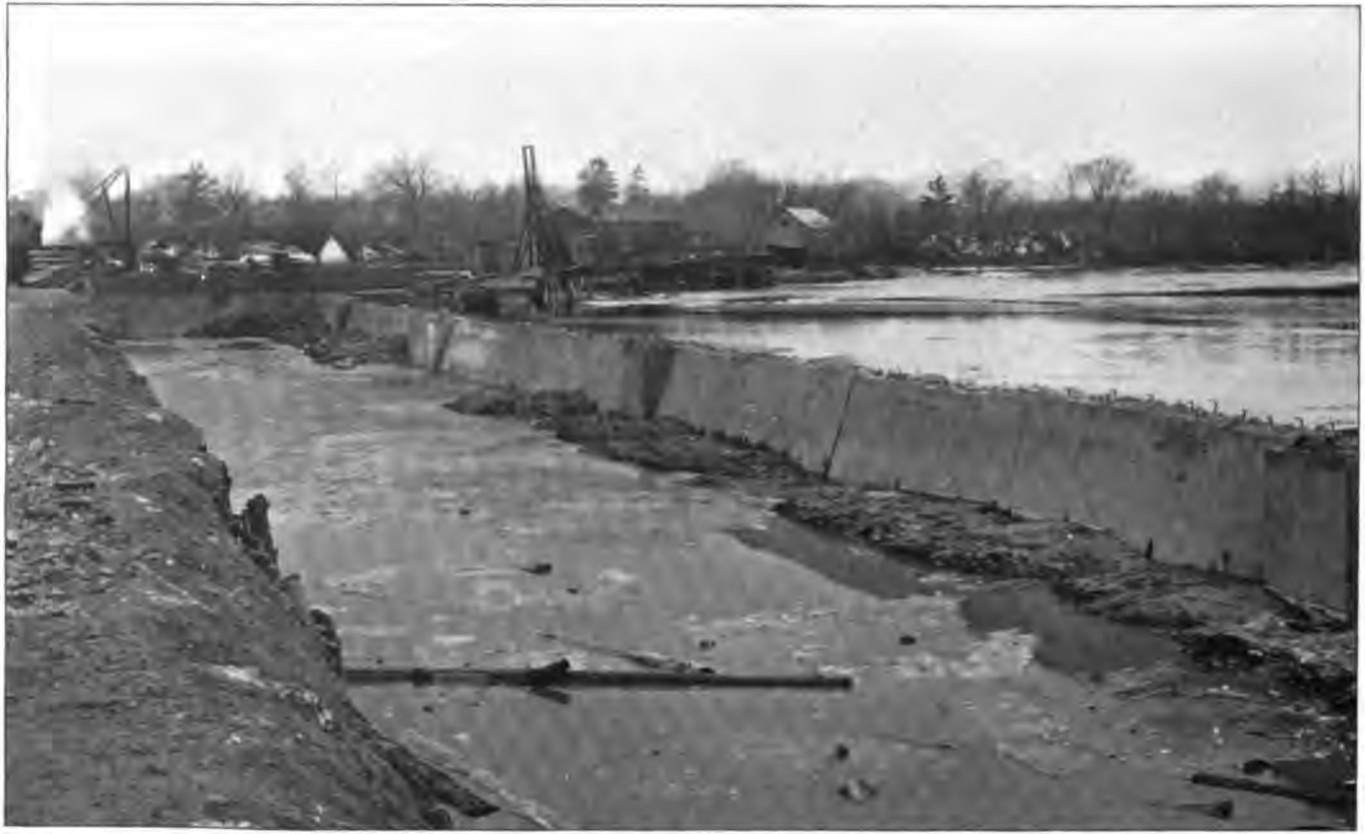

Barge Canal, Terminal Contract No. 23 — Plattsburg.

Rear view of concrete dockwall. This wall rests on timber, stone-filled cribs. It will be backfilled to form the terminal dock.

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MIDDLE DIVISION.

All Barge canal terminal work on the Middle Division is in charge of Terminal Division Engineer Guy L. Noble. Mr. Noble makes the following report of work done during the fiscal year:

Preliminary surveys, borings and maps have been made for terminals at the following places: Watkins, East Varick, Dresden and on the east side of the river at Oswego. Surveys, in addition to those made last year, have also been made at Syracuse, Oswego, Constantia and Cleveland.

Contracts were let for terminals at Utica and Rome and plans and estimates have been prepared for Oswego (east side), Syracuse, Constantia and Cleveland.

A detailed report of the work performed on the three contracts in this division follows:

Terminal Contract No. 1 — Ithaca.

This contract is for the construction of a reinforced concrete dockwall, 771 feet long, and the excavation of a turning basin, 150 feet by 500 feet, adjacent to the improved Cayuga inlet in the city of Ithaca. The contract was awarded August 21, 1912, and called for completion January 1, 1913, this date having been later extended. D. W. Overocker, Assistant Engineer, has had charge of the engineering work on this contract for the State.

The contractors began delivering machinery and materials and constructing storehouses early in October, 1912, but no construction work was done until the first part of April, 1913.

This dockwall is built of reinforced concrete sheet-piles, driven side by side with a monolithic concrete cap above water surface, the whole structure being anchored by reinforced concrete ties to concrete anchor piles and dead-men 40 feet back from the face of the dock.

By September 30, 1913, all but 35 of the reinforced concrete sheet-piles forming the dockwall had been driven in place and also all the reinforced concrete anchor piles. The monolithic cap on the dockwall, together with the concrete ties and dead-men, had been completed for 673 linear feet of dock and a large part of the grading back of the wall was completed. Some of the work of framing the wooden fenders had also been done, but none of the fenders were in place.

Terminal Contract No. 15 — *Utica.*

This contract is for the construction of a lock and approaches at the junction of the terminal channel with the Barge canal, the excavation of 2,200 linear feet of channel, the construction of a turning basin 600 feet by 580 feet (adjacent to Genesee and Lee streets), the building of 1,208 linear feet of dockwall along two sides of the turning basin, the construction of a movable dam in the Mohawk river channel to control the elevation of the water in the channel and turning basin and the grading back of the dockwalls and the approaches from the streets.

The contract was awarded to Albert M. Banker, January 8, 1913, and calls for completion December 31, 1914. John R. Baxter, Supervising Engineer, has had charge of the engineering work on this contract for the State.

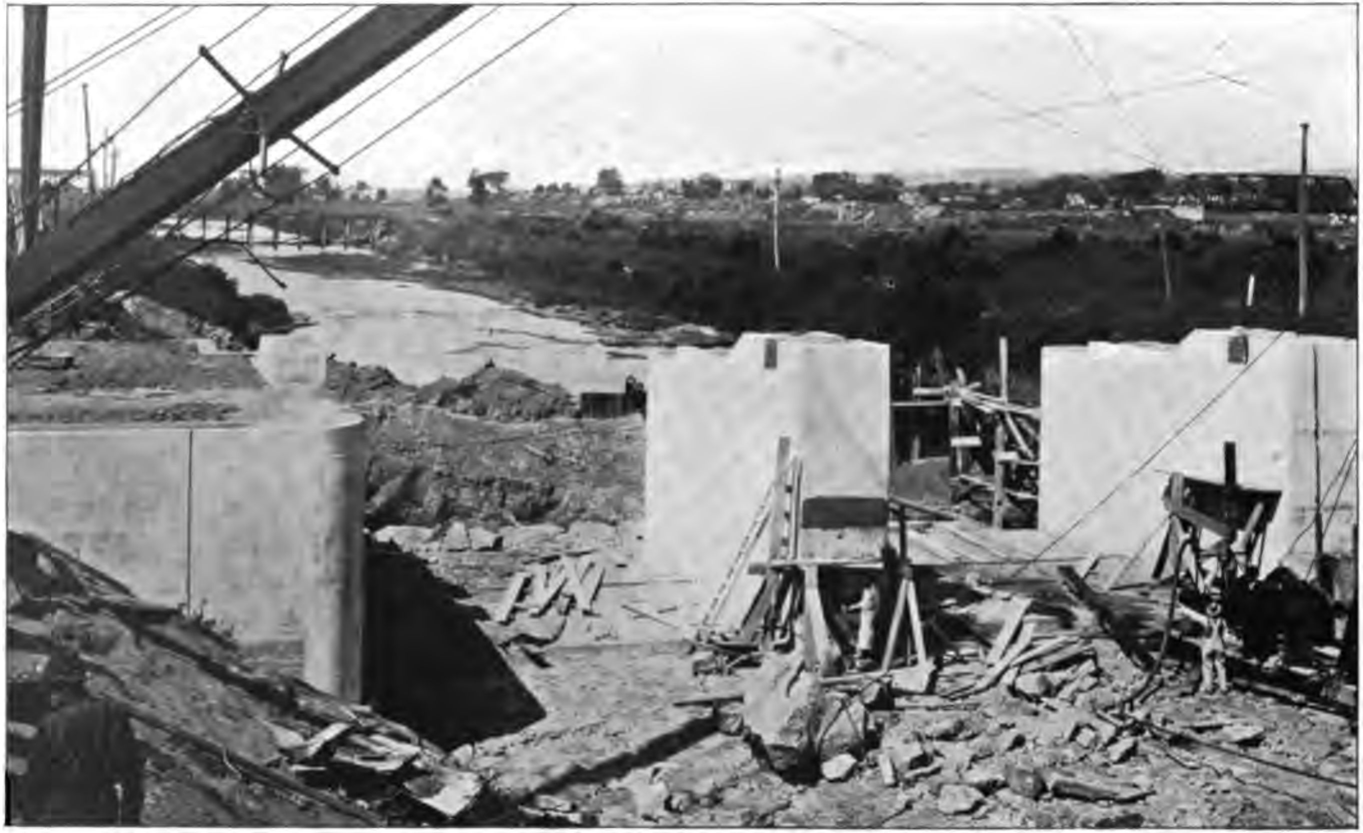
The contractor began assembling this plant in March and excavation on the contract started the latter part of April. Work was pushed on the movable dam and on September 30 this structure was about 50 per cent completed. A trench has been excavated the full length of the dockwall preparatory to driving the foundation piles and piles have been driven and capped for about 800 linear feet of wall.

Terminal Contract No. 16 — *Rome.*

This contract is for the construction of 1,044 linear feet of steel and concrete dockwall adjacent to Mill street, Rome, the excavation of a turning basin 300 feet by 1,000 feet and the grading of the approach from the street to the terminal site and the terminal site itself, for a distance of 100 feet back from the face of the dock.

The contract was awarded to the M. A. Talbott Co., November 19, 1912, and calls for completion December 1, 1913. A. W. Smith, Assistant Engineer, has had charge of the engineering work for the State on this contract.

The contractor began work the latter part of December, 1912, and on September 30, 1913, had driven nearly all the steel sheet-



Barge Canal, Terminal Contract No. 15 — Utica.

Taintor gate piers in the Mohawk. These gates and an adjacent dam will regulate the water-surface elevation in the terminal basin.

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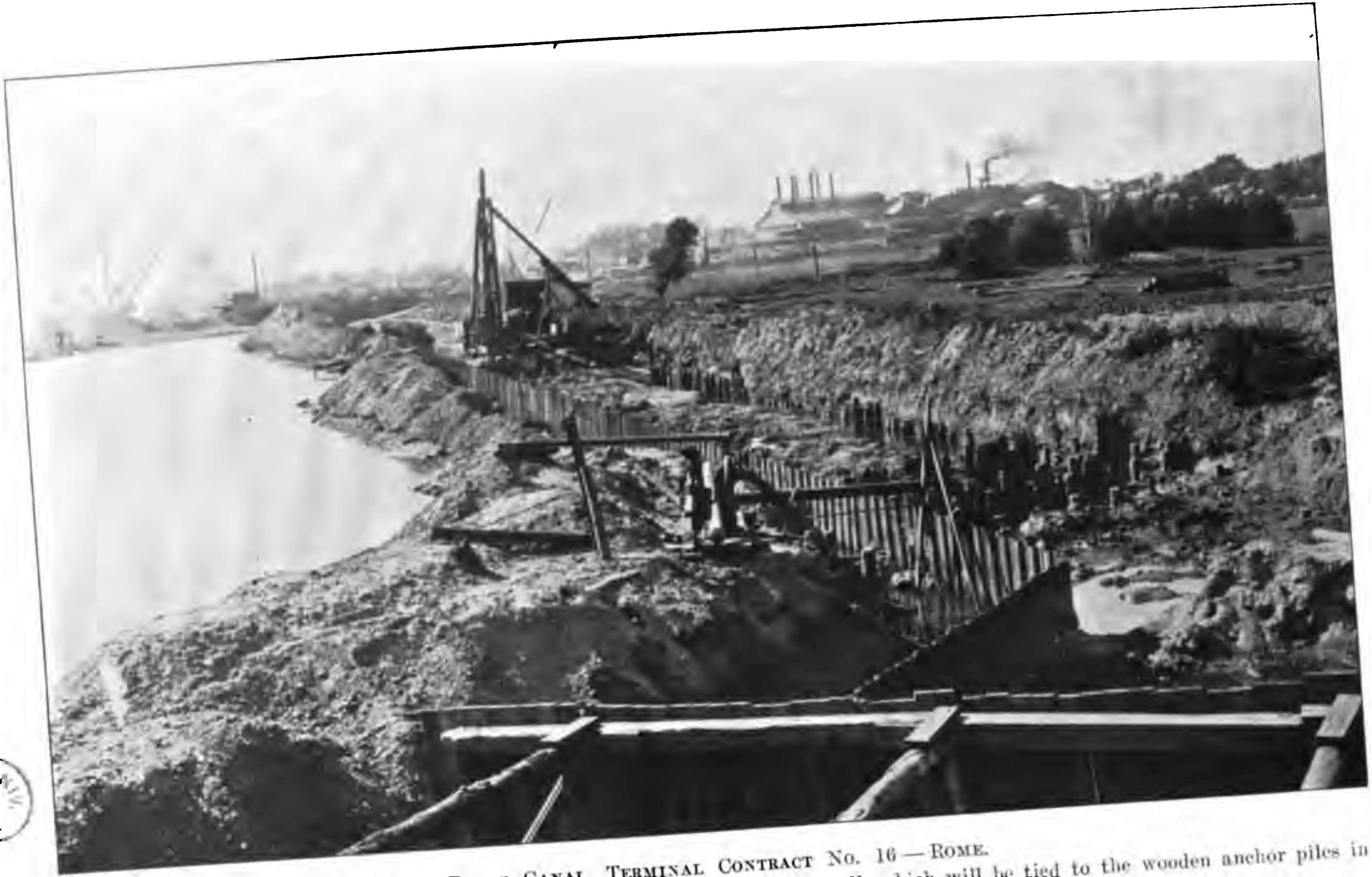


BARGE CANAL, TERMINAL CONTRACT No. 16 — ROME.

Steel sheet-piling for dockwall. This piling is to be capped by a concrete wall, which will be tied to the wooden anchor piles in the rear by steel rods.

piling, which, after being covered with concrete, will form the dockwall. This wall is to be anchored to a row of piles 35 feet back from the face of the dock and these anchor piles have been driven for one-half the length of the wall. About one-half the required excavation for the turning basin has been made by the hydraulic dredge *Stanwix*.

WESTERN DIVISION.

Resident Engineer C. J. McDonough is in charge of all work on the Western Division, a report of which follows:

The Western Division includes that portion of the Erie canal beginning at the county line between Wayne and Seneca counties and extends westerly to Lake Erie.

The principal work of the past fiscal year has been to make surveys and to prepare plans and estimates of cost for providing terminals at those places specified in the Terminal Law and such other places as have presented petitions for terminals as required by that act. Construction work also has been carried on under terminal contract No..17, as is herewith reported.

Preliminary Work.

At Buffalo contract plans and estimate of cost have been prepared and approved for dredging a harbor and constructing two piers and bulkhead walls in the Erie basin. Plans and estimates of cost have been prepared for deepening the Ohio basin, widening the entrance to and constructing a permanent dock around the basin. A survey has been made of the present Erie canal from Wilkeson street northerly to the Black Rock harbor and plans and estimate of cost have been prepared for dredging a 100-foot channel and raising the bridges to provide standard Barge canal clearances.

At Rochester a survey was made of the present Erie canal from the wide waters at the western line of the city of Rochester to South Greece and plans and estimate of cost were prepared for the improvement of this portion of the canal and for a terminal at the wide waters.

At Lyons a survey has been made for the proposed terminal on the south side of the canal west of Geneva street and plans and comparative estimates of cost have been prepared for a timber crib with concrete cap and for a pile and concrete dockwall.

Surveys have been made and location maps prepared for terminals at Medina, Albion, Holley, Brockport, Middleport and Spencerport and location maps are being prepared for the proposed terminals at Clyde and Palmyra.

Construction Work — Terminal Contract No. 17 *— Lockport.*

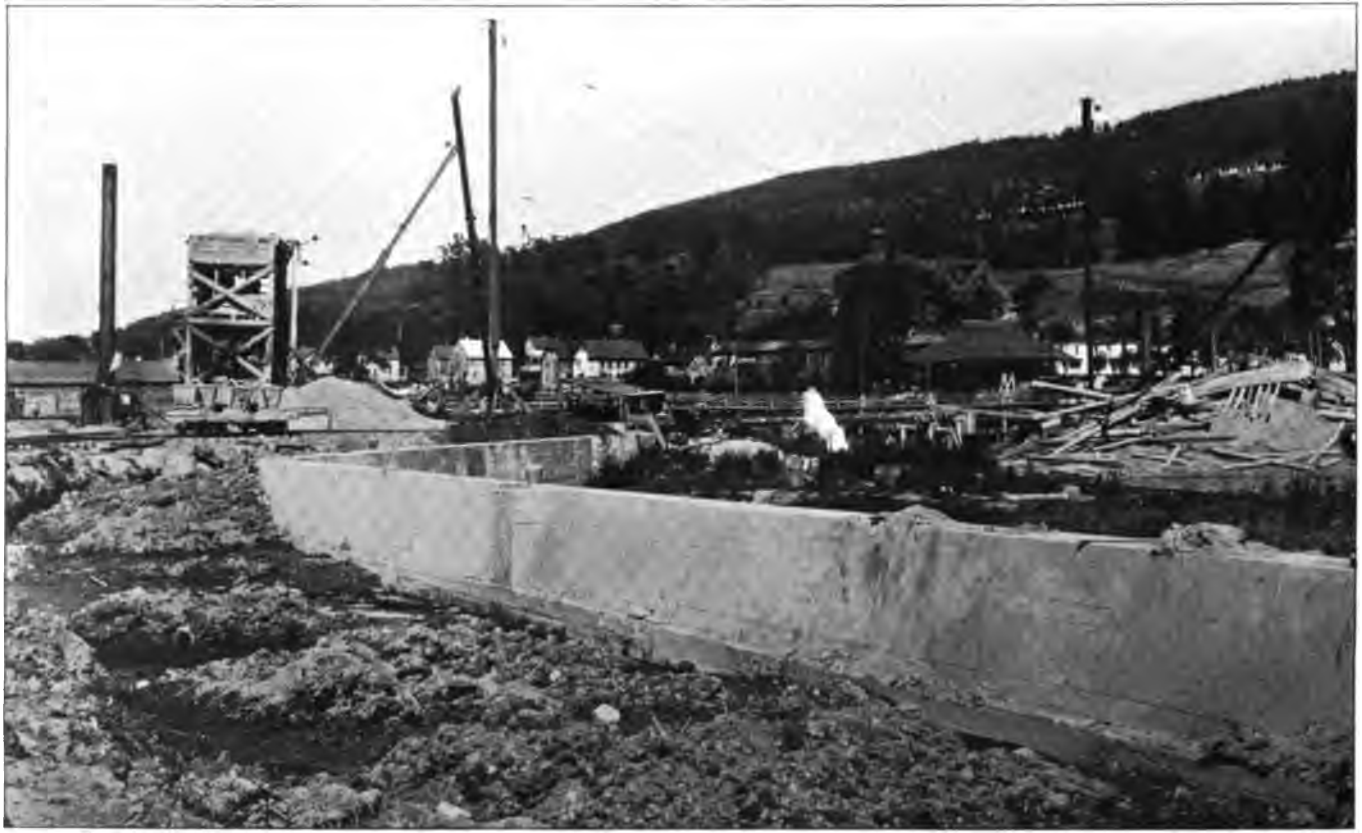
This contract, awarded to the John Johnson Construction Co., on December 4, 1912, provides for grading and paving the terminal sites and approaches in the city of Lockport. Elias H. Anderson, Assistant Engineer, is in charge.

At the lower town terminal the grading and paving have been completed. At the uptown terminal two steam-shovels have been in operation for the past two months and have completed 78 per cent of the excavation. Forty-six per cent of the work on this contract has been completed.

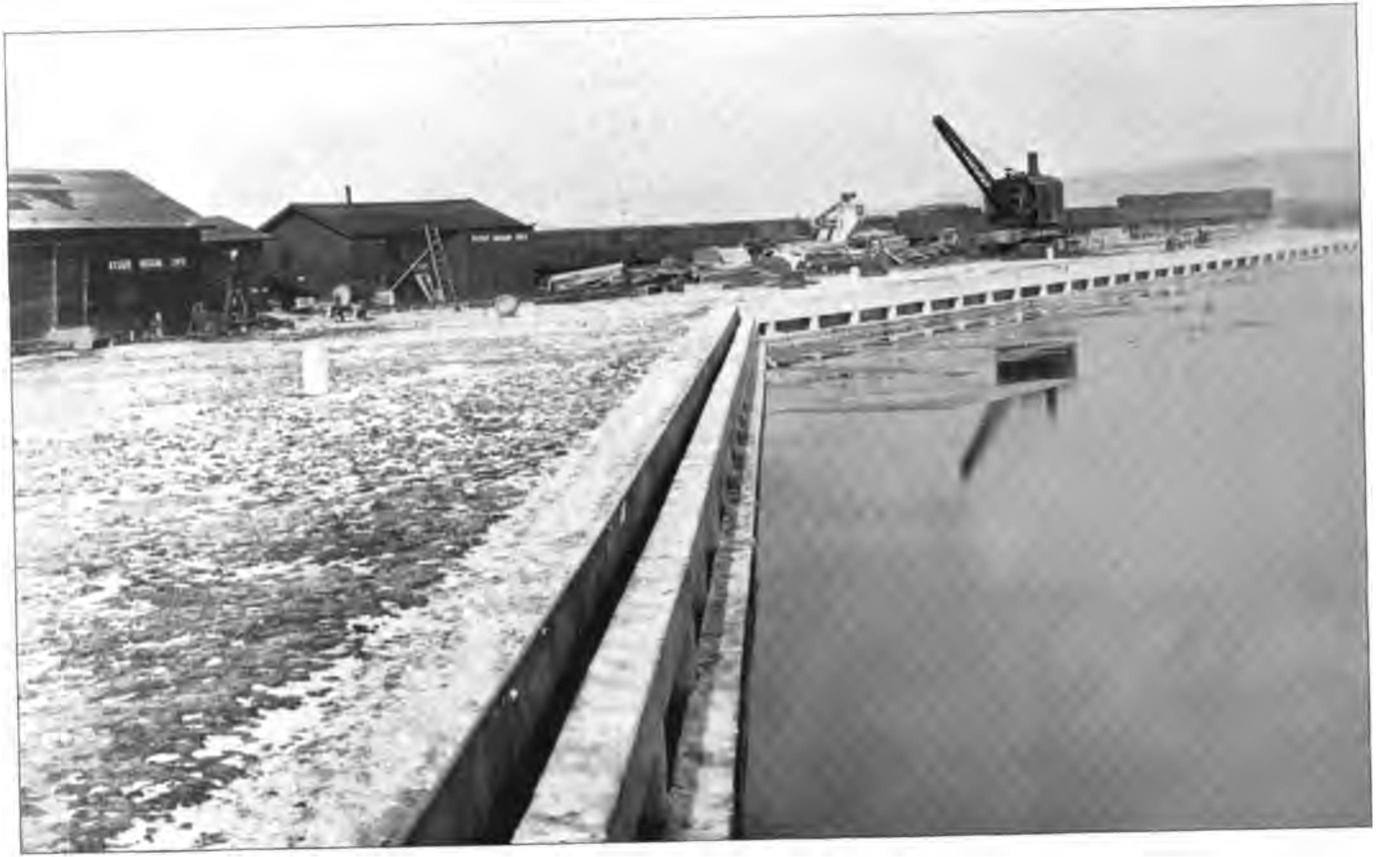
Respectfully submitted,

J. A. O'CONNOR,

Terminal Engineer.



Barge Canal, Terminal Contract No. 11 — Ilion.
Rear view of dockwall, which borders the harbor to be excavated on the south side of the canal channel. Wall to be backfilled, forming dock area.



Barge Canal, Terminal Contract No. 1 — Ithaca.

Finished dock. The fender timbers are supported on wooden piles and are independent of the dockwall.

THE FOLLOWING STATEMENTS SHOW THE NAMES, RANK AND COMPENSATION OF ENGINEERS EMPLOYED ON THE CONSTRUCTION OF BARGE CANAL TERMINALS IN THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES, FOR THE FISCAL YEAR ENDED SEPTEMBER 30, 1913.

Construction of Barge Canal Terminals — Head Office Account.

Chapter 746, Laws of 1911; Chapter 244, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
J. A. O'Connor	Terminal engineer	$6,000 per year	$6,000 00	$1,314 87	$7,314 87
H. O. Schermerhorn	Resident engineer	3,000 per year	3,000 00	12 98	3,012 98
Fred C. Stahl	Bookkeeper	1,500 per year	1,324 00	19 41	1,343 41
J. A. Murray	Stenographer	1,200 per year	1,043 55	....	1,043 55
M. J. Sullivan	Stenographer	1,200 per year	1,043 55	....	1,043 55
W. S. Ward	Correspondence clerk	1,380 per year	824 06	11 04	835 10
Harvey W. Nutter	Chauffeur	1,500 per year	1,250 00	259 81	1,509 81
J. E. Hall	Draftsman	5 00 per day	255 00	....	255 00
G. G. Underhill	Assistant engineer	7 00 per day	2,016 00	....	2,016 00
L. Greenalch	Rodman	3 50 per day	49 00	....	49 00
H. J. Richardson	Rodman	4 00 per day	96 00	99 35	195 35
J. H. McEntee	Chainman	3 00 per day	81 00	....	81 00
Leonard Paige	Boatman	3 00 per day	....	1 20	1 20
E. H. Fitzpatrick	Laborer	2 00 per day	106 00	....	106 00
Joseph W. Harbinger	Laborer	2 00 per day	626 00	....	626 00
Daniel Hartnett	Laborer	2 00 per day	216 00	....	216 00
James Hopkins	Laborer	2 00 per day	294 00	....	294 00
Thomas A. Kelly	Laborer	2 00 per day	152 00	....	152 00
Hugh McCann	Laborer	2 00 per day	626 00	....	626 00
John A. McCurdy	Laborer	2 00 per day	420 00	....	420 00
H. F. McGowen	Laborer	2 00 per day	368 00	....	368 00
Leonard Paige	Laborer	2 00 per day	458 00	....	458 00
Gilbert Venter	Laborer	2 00 per day	154 00	....	154 00
A. Wilson	Laborer	2 00 per day	158 00	....	158 00
			$20,560 16	$1,718 66	$22,278 82

Incidental Expenses.

Instruments, tools and appliances	$255 00	
Office rent	1,213 42	
Fuel and light	60 00	
Stationery and printing	951 07	
Postage	200 59	
Telephone and telegraph	1,030 58	
Express and freight	107 45	
Miscellaneous	7,226 76	
		11,044 87
Total		$33,323 69

Construction of Barge Canal Terminals — Eastern Division Account.

Chapter 746, Laws of 1911; Chapter 244, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
William H. Dernell	Draftsman	$5 00 per day	$835 00	$67 94	$902 94
J. E. Hall	Draftsman	5 00 per day	1,375 00	33 18	1,408 18
F. B. Holmes	Draftsman	5 00 per day	860 00	7 18	867 18
A. J. Griffin	Tracer	75 per month	810 00	....	810 00
R. N. Barrett	Assistant engineer	5 00 per day	315 00	....	315 00

Construction of Barge Canal Terminals — Eastern Division Account — (Continued).

Chapter 746, Laws of 1911; Chapter 244, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
W. C. Bratton	Assistant engineer	$6 00 per day	$739 00	$16 20	$755 20
F. S. Crowell	Assistant engineer	7 00 per day	681 00	384 59	1,065 59
C. R. De Graff	Assistant engineer	6 00 per day	870 00	113 49	983 49
W. H. Dernell	Assistant engineer	6 00 per day	665 00	177 34	842 34
F. B. Holmes	Assistant engineer	6 00 per day	670 00	65 71	735 71
J. B. Maguire	Assistant engineer	6 00 per day	342 00	50 44	392 44
A. C. Richards	Assistant engineer	7 00 per day	2,258 00	51 48	2,309 48
E. W. Sylvester	Assistant engineer	6 00 per day	342 00		342 00
W. A. Treadwell	Assistant engineer	7 00 per day	1,941 00	298 52	2,239 52
F. J. Doerhoefer	Leveler	5 00 per day	285 00	301 85	586 85
L. Greenalch	Leveler	4 50 per day	828 00	12 58	840 58
F. J. Lynch	Leveler	4 50 per day	693 00		693 00
H. J. Stabile	Leveler	5 00 per day	1,685 00	399 81	2,084 81
H. F. Eagan	Rodman	3 50 per day	364 00		364 00
J. Gurin	Rodman	3 50 per day	164 50		164 50
Nathan Levy	Rodman	3 50 per day	203 00		203 00
J. H. McEntee	Rodman	3 50 per day	210 00		210 00
H. J. Richardson	Rodman	4 00 per day	32 00	30 01	62 01
Paul Scully	Rodman	3 50 per day	343 00		343 00
B. J. Robinson	Rodman	3 50 per day	66 50		66 50
G. L. Stillman	Rodman	4 00 per day	456 00		456 00
Joseph F. Sweeney	Rodman	3 50 per day	462 00		462 00
C. E. Vedder	Rodman	3 50 per day	241 50		241 50
J. J. Webster	Rodman	3 50 per day	266 00		266 00
H. F. Eagan	Chainman	3 00 per day	81 00		81 00
J. H. McEntee	Chainman	3 00 per day	690 00		690 00
H. S. Rappleye	Chainman	2 50 per day	130 00		130 00
G. D. Wetsel	Chainman	3 00 per day	138 00		138 00
W. W. Barclay	Inspector	5 00 per day	485 00		485 00
E. L. Casey	Boatman	3 00 per day	87 00		87 00
J. B. Cronkhite	Boatman	3 00 per day	372 00		372 00
E. J. Farrell	Boatman	3 00 per day	891 00		891 00
Edward Harrigan	Boatman	3 00 per day	468 00		468 00
C. J. Hartigan	Boatman	3 00 per day	237 00		237 00
Francis I. Kelly	Boatman	3 00 per day	252 00		252 00
Thomas A. Kelly	Boatman	3 00 per day	609 00		609 00
Edward Kilmartin	Boatman	3 00 per day	216 00		216 00
A. Lenhardt	Boatman	3 00 per day	198 00		198 00
E. T. McCarthy	Boatman	3 00 per day	216 00		216 00
T. F. McGahan	Boatman	3 00 per day	384 00		384 00
Robert McLaughlin	Boatman	3 00 per day	207 00		207 00
Henry McManus	Boatman	3 00 per day	213 00		213 00
J. F. Malin	Boatman	3 00 per day	168 00		168 00
P. J. Murphy	Boatman	3 00 per day	237 00		237 00
Leonard Paige	Boatman	3 00 per day	252 00		252 00
E. J. Palmer	Boatman	3 00 per day	555 00		555 00
George L. Riley	Boatman	3 00 per day	348 00		348 00
James F. Smith	Boatman	3 00 per day	393 00		393 00
James G. Waldron	Boatman	3 00 per day	297 00	33 03	330 03
D. H. Carrigan	Laborer	2 00 per day	116 00		116 00
D. F. Cavanaugh	Laborer	2 00 per day	12 00		12 00
John Cox	Laborer	2 00 per day	40 00		40 00
William Culnan	Laborer	2 00 per day	106 00		106 00
John Eisenlord	Laborer	2 00 per day	168 00		168 00
H. Elmendorf	Laborer	2 00 per day	56 00		56 00
H. E. Elwood	Laborer	2 00 per day	28 00		28 00
Thomas M. Farrell	Laborer	2 00 per day	10 00		10 00
Kenneth Firman	Laborer	2 00 per day	64 00		64 00
Peter Fisch	Laborer	2 00 per day	34 00		34 00
R. P. Ford	Laborer	2 00 per day	266 00		266 00
A. Gertenbach	Laborer	2 00 per day	162 00		162 00
A. H. Gleason	Laborer	2 00 per day	110 00		110 00
William A. Hickey	Laborer	2 00 per day	106 00		106 00
James Hopkins	Laborer	2 00 per day	106 00		106 00
George A. Kehoe	Laborer	2 00 per day	96 00		96 00
Thomas A. Kelly	Laborer	2 00 per day	72 00		72 00
H. W. Koreman	Laborer	2 00 per day	106 00		106 00
W. P. Logan	Laborer	2 00 per day	162 00		162 00
George A. Lynch	Laborer	2 00 per day	242 00		242 00
Michael Mahoney	Laborer	2 00 per day	168 00		168 00

Construction of Barge Canal Terminals — Eastern Division Account — (Concluded).

Chapter 746, Laws of 1911; Chapter 244, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
John Maloney	Laborer	$2 00 per day	$38 00	....	$38 00
Aaron Matthias	Laborer	2 00 per day	106 00	....	106 00
E. L. McDermott	Laborer	2 00 per day	120 00	....	120 00
William McDermott	Laborer	2 00 per day	628 00	....	628 00
Vincent McDonald	Laborer	2 00 per day	26 00	....	26 00
Philip Montana	Laborer	2 00 per day	106 00	....	106 00
John J. Nurney	Laborer	2 00 per day	108 00	....	108 00
H. C. Parke	Laborer	2 00 per day	526 00	....	526 00
James Sheeran	Laborer	2 00 per day	116 00	....	116 00
James F. Smith	Laborer	2 00 per day	110 00	....	110 00
H. J. Talford	Laborer	2 00 per day	130 00	....	130 00
Edward Tourbert	Laborer	2 00 per day	282 00	....	282 00
Gilbert Venter	Laborer	2 00 per day	480 00	....	480 00
S. B. Warner	Laborer	2 00 per day	106 00	....	106 00
A. C. Bullis	Gage reader	0 20 per hour	4 60	....	4 60
George F. James	Gage reader	0 20 per hour	4 00	....	4 00
H. Kramer	Foreman of borings	5 00 per day	880 00	$138 87	1,018 87
J. L. Bradford	Bridge designer	175 per month	175 00	....	175 00
J. C. Podmore	Bridge designer	175 per month	1,750 00	....	1,750 00
			$35,052 10	$2,182 22	$37,234 32
Incidental Expenses.					
Instruments, tools and appliances				$88 58	
Office rent				439 50	
Fuel and light				14 00	
Stationery and printing				675 33	
Postage				26 18	
Telephone and telegraph				109 56	
Express and freight				87 39	
Miscellaneous				1,230 56	
					2,671 10
Total					$39,905 42

Construction of Barge Canal Terminals — Southern Division Account.

Chapter 746, Laws of 1911; Chapter 244, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Carleton Greene	Division engineer	$4,000 per year	$4,000 00	$151 41	$4,151 41
John F. Conahey	Stenographer	1,200 per year	980 00	....	980 00
James E. Stewart	Clerk	1,500 per year	1,350 00	....	1,350 00
S. R. Bellows	Assistant engineer	7 00 per day	1,195 00	9 35	1,204 35
S. E. Brettheimer	Assistant engineer	6 00 per day	988 00	....	988 00
Ely Gamse	Assistant engineer	6 00 per day	1,417 00	....	1,417 00
L. T. Howard	Assistant engineer	7 00 per day	1,286 00	403 01	1,689 01
F. Leiser, Jr	Assistant engineer	5 00 per day	65 00	....	65 00
I. S. Matlaw	Assistant engineer	7 00 per day	91 00	....	91 00
Jacob Bendel	Leveler	5 00 per day	910 00	....	910 00
J. B. Doughty	Leveler	5 00 per day	975 00	....	975 00
F. Leiser, Jr	Leveler	4 50 per day	697 50	....	697 50
S. B. Sheridan	Leveler	4 50 per day	697 50	....	697 50
J. P. Byrne	Rodman	3 50 per day	637 00	....	637 00
F. Leiser, Jr	Rodman	4 00 per day	108 00	....	108 00
S. B. Sheridan	Rodman	4 00 per day	108 00	....	108 00
J. J. McDonald	Chainman	3 00 per day	39 00	....	39 00
Edward Bauch	Boatman	3 00 per day	546 00	....	546 00

Construction of Barge Canal Terminals — Southern Division Account — (Concluded).

Chapter 746, Laws of 1911; Chapter 244, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Robert Brenner	Boatman	$3 00 per day	$468 00	....	$468 00
John J. Casey	Boatman	3 00 per day	1,026 00	....	1,026 00
Andrew Corcoran	Boatman	3 00 per day	546 00	....	546 00
James Curtis	Boatman	3 00 per day	546 00	....	546 00
William J. Hall	Boatman	3 00 per day	51 00	....	51 00
Luke A. Halpin	Boatman	3 00 per day	546 00	....	546 00
Julius Kaiser	Boatman	3 00 per day	30 00	....	30 00
William J. Keefe, Jr	Boatman	3 00 per day	363 00	....	363 00
William L. Kelly	Boatman	3 00 per day	546 00	....	546 00
John J. McMahon	Boatman	3 00 per day	546 00	....	546 00
C. Ottmer	Boatman	3 00 per day	516 00	....	516 00
David Shapiro	Boatman	3 00 per day	465 00	....	465 00
Peter Shine	Boatman	3 00 per day	1,005 00	....	1,005 00
Frank Boland	Laborer	2 00 per day	162 00	....	162 00
Daniel Leddy	Laborer	2 00 per day	684 00	....	684 00
Patrick Shannon	Laborer	2 00 per day	626 00	....	626 00
			$24,216 00	$563 77	$24,779 77
Incidental Expenses.					
Instruments, tools and appliances				$48 72	
Office rent				3,250 00	
Stationery and printing				79 60	
Postage				42 50	
Telephone and telegraph				296 88	
Express and freight				19 04	
Miscellaneous				1,721 63	
					5,458 37
Total					$30,238 14

Construction of Barge Canal Terminals — Middle Division Account.

Chapter 746, Laws of 1911; Chapter 244, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy L. Noble	Division engineer	$4,000 per year	$4,000 00	$226 85	$4,226 85
L. D. Brownell	Resident engineer	3,000 per year	3,000 00	48 89	3,048 89
L. A. Burns	Resident engineer	3,000 per year	1,750 00	320 40	2,070 40
John R. Baxter	Supervising engineer	3,000 per year	3,000 00	36 42	3,036 42
Harry J. Furlong	Stenographer	1,200 per year	1,008 33	....	1,008 33
William H. Dernell	Draftsman	5 00 per day	200 00	....	200 00
H. W. Henderson	Draftsman	4 50 per day	1,329 50	....	1,329 50
F. B. Holmes	Draftsman	5 00 per day	200 00	....	200 00
Lewis Bartlett	Assistant engineer	7 00 per day	826 00	12 15	838 15
A. G. Card	Assistant engineer	6 00 per day	1,878 00	17 55	1,895 55
F. S. Crowell	Assistant engineer	7 00 per day	463 00	16 46	479 46
D. W. Overocker	Assistant engineer	7 00 per day	2,077 00	271 39	2,348 39
A. W. Smith	Assistant engineer	7 00 per day	1,372 00	34 64	1,406 64
W. A. Treadwell	Assistant engineer	7 00 per day	240 00	....	240 00
E. A. Dollard	Leveler	5 00 per day	1,565 00	19 88	1,584 88
L. Greenalch	Leveler	4 50 per day	535 50	....	535 50
I. H. Smallwood	Leveler	5 00 per day	1,640 00	229 36	1,869 36
L. Greenalch	Rodman	3 50 per day	45 50	....	45 50
Louis Oppenheim	Rodman	3 50 per day	105 00	....	105 00
F. A. Gordon	Rodman	4 00 per day	1,268 00	....	1,268 00
J. E. Smith	Rodman	4 00 per day	1,182 00	....	1,182 00
J. E. Smith	Chainman	3 00 per day	9 00	....	9 00

Construction of Barge Canal Terminals — Middle Division Account — (Concluded).

Chapter 746, Laws of 1911; Chapter 244, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
T. M. Oliver	Inspector	$5 00 per day	$240 00	....	$240 00
P. F. Hadzer	Boatman	3 00 per day	684 00	....	684 00
Hugo Hensler	Boatman	3 00 per day	309 00	....	309 00
W. J. Keefe, Jr	Boatman	3 00 per day	159 00	....	159 00
C. Ottmer	Boatman	3 00 per day	51 00	....	51 00
John Siegrist, Jr	Boatman	3 00 per day	171 00	....	171 00
John J. Tubridy	Boatman	3 00 per day	240 00	....	240 00
Harvey Abrams	Laborer	2 00 per day	626 00	....	626 00
Leon Carnell	Laborer	2 00 per day	27 00	....	27 00
S. A. Cohen	Laborer	2 00 per day	56 00	....	56 00
Walter Conley	Laborer	2 00 per day	56 00	....	56 00
Thomas Dwyer	Laborer	2 00 per day	224 00	....	224 00
H. E. Elwood	Laborer	2 00 per day	114 00	....	114 00
I. Goldbas	Laborer	2 00 per day	366 00	....	366 00
P. F. Hadzer	Laborer	2 00 per day	196 00	....	196 00
James Hennessy	Laborer	2 00 per day	24 00	....	24 00
G. A. Millert	Laborer	2 00 per day	250 00	....	250 00
James O'Brien	Laborer	2 00 per day	254 00	....	254 00
Daniel Scanlon	Laborer	2 00 per day	378 00	....	378 00
John J. Siegrist, Jr	Laborer	2 00 per day	252 00	....	252 00
William Smith	Laborer	2 00 per day	188 00	....	188 00
H. J. Talford	Laborer	2 00 per day	28 00	....	28 00
P. D. Unger	Axeman	2 50 per day	215 00	....	215 00
H. W. Stoneburg	Foreman of borings	4 00 per day	864 00	$79 76	943 76
J. C. Podmore	Bridge designer	175 per month	350 00	....	350 00
			$34,015 83	$1,313 75	$35,329 58
	Incidental Expenses.				
Instruments, tools and appliances				$65 28	
Office rent				2,138 82	
Fuel and light				12 36	
Stationery and printing				222 14	
Postage				59 54	
Telephone and telegraph				444 02	
Express and freight				188 05	
Miscellaneous				1,201 20	
					4,331 41
Total					$39,660 99

Construction of Barge Canal Terminals — Western Division Account.

Chapter 746, Laws of 1911; Chapter 244, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
C. J. McDonough	Resident engineer	$3,000 per year	$3,000 00	$89 49	$3,089 49
H. R. Norvell	Bookkeeper	1,200 per year	1,200 00	....	1,200 00
A. O. Peabody	Draftsman	4 50 per day	913 50	....	913 50
George Goetz	Tracer	75 00 per month	551 61	....	551 61
I. L. Stalker	Tracer	83 33 per month	1,000 00	....	1,000 00
Elias H. Anderson	Assistant engineer	7 00 per day	2,112 00	207 12	2,319 12
A. O. Peabody	Assistant engineer	5 00 per day	550 00	....	550 00
Elwin G. Speyer	Assistant engineer	6 00 per day	1,878 00	96 02	1,974 02
C. J. Bean	Leveler	5 00 per day	1,620 00	....	1,620 00
Joseph Boscaglia	Boatman	3 00 per day	571 00	....	571 00
Thomas F. Burns	Boatman	3 00 per day	516 00	....	516 00
P. J. Cleary	Boatman	3 00 per day	381 00	....	381 00

Construction of Barge Canal Terminals — Western Division Account — (Concluded).

Chapter 746, Laws of 1911; Chapter 244, Laws of 1913.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. J. Cunningham	Boatman	$3 00 per day	$585 00	....	$585 00
Harry Loop	Boatman	3 00 per day	765 00	....	765 00
Stephen McQuade	Boatman	3 00 per day	612 00	....	612 00
M. J. Piersall	Boatman	3 00 per day	870 00	....	870 00
T. J. Reardon	Boatman	3 00 per day	873 00	....	873 00
J. T. Regan	Boatman	3 00 per day	159 00	....	159 00
Stephen Skelly	Boatman	3 00 per day	438 00	....	438 00
Charles F. Tatu	Boatman	3 00 per day	531 00	....	531 00
F. W. Theobald	Boatman	3 00 per day	243 00	....	243 00
Charles Wilson	Boatman	3 00 per day	570 00	....	570 00
Joseph Boscaglia	Laborer	2 00 per day	38 00	....	38 00
George Goets	Laborer	2 00 per day	106 00	....	106 00
Harry Loop	Laborer	2 00 per day	30 00	....	30 00
			$20,113 11	$392 63	$20,505 74
Incidental Expenses.					
Instruments, tools and appliances				$2 40	
Office rent				1,560 00	
Stationery and printing				78 28	
Postage				18 59	
Telephone and telegraph				108 19	
Express and freight				15 13	
Miscellaneous				168 98	
					1,951 57
Total					$22,457 31

SUMMARY OF SERVICES, TRAVEL AND ALL OTHER EXPENSES.

Construction of Barge Canal Terminals.

Chapter 746, Laws of 1911; Chapter 244, Laws of 1913.

DIVISION.	Services.	Travel.	Instruments, tools and appliances.	Office rent.	Fuel and light.	Stationery and printing.	Postage.	Telephone and telegraph.	Freight and express.	Miscellaneous.	Total.
Head office	$20,560 16	$1,718 66	$255 00	$1,213 42	$60 00	$951 07	$200 59	$1,030 58	$107 45	$7,226 76	$33,323 69
Eastern division	35,052 10	2,182 22	88 58	439 50	14 00	675 33	26 18	109 56	87 39	1,230 56	39,905 42
Southern division	24,216 00	563 77	48 72	3,250 00	....	79 60	42 50	296 88	19 04	1,721 63	30,238 14
Middle division	34,015 83	1,313 75	65 28	2,138 82	12 36	222 14	59 54	444 02	188 05	1,201 20	39,660 99
Western division	20,113 11	392 63	2 40	1,560 00	....	78 28	18 59	108 19	15 13	168 98	22,457 31
Totals	$133,957 20	$6,171 03	$459 98	$8,601 74	$86 36	$2,006 42	$347 40	$1,989 23	$417 06	$11,549 13	$165,585 55

Percentage of Engineering Expenses on Barge Canal Terminals.

Contract No.	Engineer in charge.	Contractor.	Engineer's estimate.	Engineering expenses.	Per cent.
1	D. W. Overocker	New York State Dredging Corp	$23,870 00	$2,639 21	11.06
2	A. C. Richards	Raymond Concrete Pile Co	74,380 00	8,459 53	11.37
3	H. J. Stabile	Aetna Engineering & Cont'g Co	47,070 00	2,383 90	5.06
5	J. E. Hall	E. Brown Baker	8,860 00	1,304 17	14.72
6	F. B. Holmes	Albert M. Banker	35,200 00	2,435 44	6.92
7	W. C. Bratton	Aldrich & Hall, Inc	16,830 00	1,035 55	6.15
7-A	W. C. Bratton	New York State Dredging Corp	69,230 00	1,395 59	2.01
8	W. A. Treadwell	American Pipe & Const'n Co	17,910 00	2,233 78	12.47
9	H. J. Stabile	Aetna Engineering & Cont'g Co	31,670 00	1,673 62	5.28
10	C. R. DeGraff	American Pipe & Const'n Co	29,920 00	1,936 88	6.47
11	H. J. Stabile	Aetna Engineering & Cont'g Co	32,210 00	2,160 54	6.71
12	C. R. DeGraff	American Pipe & Const'n Co	6,600 00	608 35	9.22
15	John R. Baxter and L. Bartlett	Albert M. Banker	49,210 00	8,290 59	16.85
16	A. W. Smith	M. A. Talbott & Co	48,770 00	2,769 25	5.68
17	C. J. Bean	John Johnson Construction Co	22,410 00	1,274 14	5.69
22	C. R. De Graff	Leary & Morrissy Co	1,730 00	452 09	26.13
23	W. H. Dernell	D. L. Taylor & Co	23,940 00	2,568 51	10.73
27	H. J. Stabile	Aetna Engineering & Cont'g Co	19,550 00	394 38	2.02
	Totals		$559,410 00	$44,015 52	*7.87

* Average.

Report of Tests

Report of the Land Bureau

REPORT OF TESTS.

Testing Laboratory — State Hall.

Albany, N. Y., *October* 1, 1913.

Hon. John A. Bensel, *State Engineer and Surveyor:*

Sir.— I have the honor to submit the following report of the work of the testing laboratory of your Department for the fiscal year ended September 30, 1913.

The work of the year has been more than simply routine, and, besides the regular testing of cement, tests are now being made of sand, gravel and concrete, as well as cement; field inspection of concrete materials is also being made. Many special tests of considerable variety have made the work of particular interest and value. The inspection of cement at the mills has become a large part of the work of the bureau. The total work done exceeds that of any previous year.

Cement Tests.

The routine work of testing cement has been large during the past year, because of the great amount of work being done upon the Barge canal and upon the public highways. The method of coöperation in making tests, as tried last year with the Highway Commission, resulted in the Commission again placing the necessary number of men in this laboratory to make the tests on cement proposed for use on highways. The supervision of their work was left with the undersigned. The work done also includes, as for several years past, a large number of tests made for work under the direction of the State Architect. The work at times required the full capacity of the laboratory, especially when field work was in full swing during the summer months. The reports of tests made do not include those made by the representatives of the Department of Highways.

During the past year there have been submitted to this laboratory for tests 453 lots of cement samples, consisting of a total of 9,392 samples. These samples represented 667,680 barrels of cement, of which 97.9 per cent were for the Barge canal and 2.1 per cent for the State Architect.

The inspection of cement at the mill permits the taking of a smaller proportion of samples to the number of barrels represented. The larger part of the work is through mill inspection, for, of the total number of barrels of cement tested, only 11,529 barrels were tested for the Barge canal after delivery upon the work.

Each sample submitted, mixed in the proportion of one part cement to three parts standard quartz sand, was tested for tensile strength at the ends of 7 and 28 days. In addition to the tests for tensile strength, each lot of samples was given tests for fineness and grinding, for initial and hard sets, for specific gravity and for soundness by means of the steam tests, the normal-water test and the normal-air test. Frequently the cements are completely analyzed and are especially checked for sulphuric anhydride ($S O_3$) and magnesia ($Mg O$).

The method of testing is practically that recommended by the American Society of Civil Engineers. The method of analysis used is that recommended by the committee of the New York Section — Society for Chemical Industry.

At the end of the 7-day tests, all results obtained on tests of samples of cement proposed for use on Barge canal work are reported to Mr. Alexander E. Kastl, Special Deputy State Engineer, and, if thought best, are held for the 28-day tests, the lots being accepted or rejected according as the results show that the cement passes or fails in the tests. The reports of all tests of cement for all other work (except Barge canal and highway work) are submitted to the Deputy State Engineer, Arnold G. Chapman. All reports of tests for the Highway Commission are made to the Engineer in charge of the Bureau of Research.

Our method of testing each sample separately for tensile strength has proven very satisfactory; in fact, by means of it, much poor cement has been discovered which would have stood the tests, had all of the samples of the lot been blended. This method, however, makes necessary a larger equipment and a more complete system of operation than is necessary under the general method of testing a blended sample. The effort has been made to maintain as complete a laboratory with as little expense as possible; and it has been acknowledged that the laboratory and its results are so complete as to be placed by experts as being among the best in the country.

The specifications for cement follow closely those recommended by the American Society for Testing Materials — varying from them only in some details.

Of the cement tested and proposed for use practically all was Portland cement. The brands represented are about the same as heretofore and consist of 22 American Portland cements and one puzzolan cement. Of the brands, 7 were manufactured in New York, 13 in Pennsylvania, and 3 in New Jersey. Fifty-five per cent of cement tested was made in New York state.

During the year many other tests of cement were made, but the most important of these were those made by the "Auto-clave test." One hundred and six lots of cement, representing 20 brands of Portland cement and one puzzolan cement, were tested. Neat briquettes of each lot were tested normally and by the "Autoclave." Retests were made on 68 lots. Some very valuable data were secured to enable the department to pass upon the merits of the test.

In addition to the regular method of sampling it has been found advisable to sample at the various mills cement proposed for use on the Barge canal. Where there is enough cement to warrant doing so, an inspector is sent to a cement mill to sample cement and inspect shipments. The plan of coöperation with the Highway Department enables the use of inspectors of either department and inspection is thus possible for both departments at less cost to each. The method of carrying on this work is as follows: The inspector takes samples from the various parts of the bin; each sample is tested in the same way as are samples taken from cement delivered on the work. The endeavor is to obtain from the sampling and the testing of these samples the "run of the product." As soon as the samples are taken the inspector places the bin of cement under the seal of this Department and the bin is so sealed that no cement can be added to or taken from it without the breaking of the seal. When the results of the tests have been secured, the reports are made in the usual way, and then, if the cement is accepted, the bin of cement is assigned to the contract which may have placed an order for the cement. When the contractor needs cement, the inspector at the mill breaks the seal on the bin, inspects the loading of the car or cars, seals these with the Department seal and then reseals the bin of cement. A notice of shipment is forwarded to the laboratory and the resident engineer in charge of the contract to which the cement has been assigned. When the car or cars arrive on the work, the seal of the Department must be broken by the resident engineer or his representative, otherwise the lot of cement must be sampled and tested in the usual way.

The work of inspection at the mill has added very considerably to the work of the Testing Laboratory. All but 1.8 per cent of the cement tested was sampled at the mill. An average of five inspectors is continually engaged in taking these samples and inspecting shipments.

SAND TESTS.

The importance of thorough examination and tests of the sands proposed for use on the Barge canal has been practically demonstrated. Seventy samples of sand and gravel have been tested along the lines of tests established during the previous year. These tests are as follows: The sands are examined under the microscope for those elements that give the sand its characteristics. The other tests are for voids, loams, fineness, or grading, and tensile strength with cement. The latter are made from the sand in its natural condition and also washed; and the cement is a " standard " cement, made by mixing together in the laboratory several brands of cement which run nearly alike in the regular tests. All tests for tensile strength cover at least 28 days, but many long-time tests are being carried. Considerable attention has been given to the methods used in making the tests and it is believed that they are the most accurate that can be employed.

The testing of sand includes also the testing and examination of gravel and of substitutes for sand, such as screenings and iron ore tailings.

CONCRETE TESTS.

In July, 1912, a hydraulic compression machine with a capacity of 200,000 pounds was placed in the laboratory. Six-inch cubes or cylinders of eight inches diameter and sixteen inches long can be tested in this machine. The Division Engineers were notified by Mr. Alexander E. Kastl, Special Deputy State Engineer, that engineers in charge of work could take advantage of this machine and from time to time make cubes of the concrete as it was being placed in the work. The plan is to mould the test piece from concrete mixed by the contractor for actual use in the work, keep it covered with a moist canvas for seven days, then allow it to be exposed under regular atmospheric conditions until the block is twenty-one days old, when it is crated and sent to the laboratory for tests. The tests are made on the blocks when twenty-eight days old. The blocks are made in duplicate at least. Several engineers have taken advantage of this opportunity and 29 series of tests and a total of 74 concrete cubes were tested during the year.

OTHER TESTS.

Besides those already reported, there have been made a large variety of other tests and analyses. Among the materials thus examined were stone, loam, wooden paving blocks, paving brick, waterproofing, wood preservatives and paints.

In addition to directing the work of the laboratory and mill inspection the undersigned has made field inspection of the concrete and concrete materials being used on all the Barge canal contracts where concrete was being placed. Several contracts were visited several times. Particular attention was given to the source of supply of the gravels, sands and stone being used in the concrete. A more definite knowledge is thus gained than is often possible through a laboratory sample, but with both tests and field inspection absolute knowledge is gained. Inspection of its actual use is also a help in considering the points of merit or demerit in the material.

Respectfully submitted,

RUSSELL S. GREENMAN,

Resident Engineer in charge of Tests.

Report of the Land Bureau of the State Engineer's Department.

ALBANY, N. Y., *October* 1, 1913.

Hon. JOHN A. BENSEL, *State Engineer and Surveyor:*

Sir.— Herewith I submit a report of the work of the Land Bureau for the year ended September 30, 1913.

A part of the work has been the examination and report, as to their engineering features, of the applications to the Commissioners of the Land Office for grants of land under water. Thirty-three such applications were examined,— three for railroad purposes, one for commerce and the remainder for restricted beneficial enjoyment. Nine applications were made for an extension of time wherein to fulfill the terms of the grants.

Maps showing all the water grants are on file in this bureau and new grants are added to the maps when made by the Land Board. Most of the grants were located near the city of Greater New York. There was one grant made in Erie county and one in Jefferson county.

The sale of State land that is ordered sold by the Commissioners of the Land Office is conducted by this bureau. During the year fourteen public auctions were held and $18,043.90 was realized therefrom.

The early records, maps and field notes filed in this bureau are being constantly examined by the public and are of great and increasing value.

Respectfully submitted,

MERRITT PECKHAM, JR.,

Land Clerk.

Report on Repairing and Restoring New York-New Jersey Boundary Line Monuments

Joint Report of the Engineers in the Matter of the Repairing and Restoration of Certain Monuments Marking the Boundary Line Between the States of New York and New Jersey.

We, the undersigned engineers, appointed by our respective State officials to coöperate in the above matter, have the honor to submit this our joint report.

MONUMENTS ACROSS LANDS UNDER WATER IN RARITAN BAY.

The monuments marking that part of the New York and New Jersey boundary line lying across lands under water in Raritan bay were repaired as follows:

Permanent Monument.

This monument was repaired by first thoroughly scraping it, then painting it with one coat of red lead and pointing up the joints with red lead putty, after which at intervals of three days apart it was given two coats of Atlantic white lead mixed with linseed oil. The old inscription was then repainted in black, the same as before.

Bids were received for this work from Hendrickson & Larsen, Anders Anderson and William H. Burbank, all of Perth Amboy, N. J. The latter proving to be the lowest bidder, the work was awarded to him on August 7, 1913. He commenced the work promptly on August 8 and completed it on August 16.

Morgan Range Beacon.

This monument was repaired by first removing the top northerly horizontal angle iron, 2½ inches by 2½ inches by ¼ inch by 6 feet long, which was found to be broken through at one of the westerly rivets, and replacing it with a new angle iron of the same dimensions, bolted in place instead of riveted. The monument was then thoroughly scraped and given one coat of red lead followed at intervals of three days apart with one coat of Dixon's red graphite paint and one coat of Dixon's black graphite paint.

The repairs to the iron work were made by Patrick White & Sons, of Perth Amboy, N. J.

Bids were received for the painting from Hendrickson & Larsen, Anders Anderson and William H. Burbank, all of Perth Amboy, N. J. The latter proving to be the lowest bidder, the work was awarded to him on August 7, 1913. He commenced the work promptly on August 9 and completed it on August 19.

MONUMENTS ACROSS LANDS UNDER WATER IN ARTHUR KILL AND KILL VON KULL.

The range monuments marking that part of the New York and New Jersey boundary line lying across lands under water in Arthur Kill and the Kill Von Kull were repaired, restored, referenced or reset as follows:

Monument No. 1.

The cross on top of this monument was recut on August 7, 1913.

Monument No. 1-A.

This monument, granite, 8 inches by 8 inches by 4 feet long, lettered "N. Y.–N. J." on its northerly side and "No. 1-A" on its southerly side, is located near the northerly line of Front street in Perth Amboy, N. J. It is 43.7 feet southwesterly at right angles from the southwesterly side, or line, produced of Hartmann's Hotel, 0.5 foot northeasterly at right angles from the northeasterly side, or line, produced of house No. 277 Front street and 2.26 feet easterly from the easterly corner of said last mentioned house No. 277.

It was set August 11, 1913, on range, or in line, between monument No. 1 and the Great Beds lighthouse and is distant 109.01 feet northerly on said range from said monument No. 1. It was set in anticipation of the time—probably the near future —when monument No. 1 by reason of the natural development of the water front land on which it is located is either destroyed, or rendered practically useless in consequence of its inaccessibility or surroundings. In setting it, an iron disk, nine inches in diameter, three-quarters of an inch thick, with a one-quarter-inch hole drilled in its centre and coated with asphaltum, was used.

The disk was first very carefully set in its proper position, in sand, by means of the hole in its centre. Sand and selected material was then carefully placed over the disk to an elevation of about six inches above it. The monument was then carefully set in its proper position directly over hole in centre of disk and with its top about level with the surface of the street.

The survey to locate this monument was made on August 7 and 8, 1913.

Monument No. 4.

This monument is located at Tottenville, S. I., on land and premises of Alfred Baxter, now occupied by George D. Emmons. It is 27.7 feet northwesterly from the northeasterly corner and 21.23 feet northeasterly from the northwesterly corner of the brick foundation of said Baxter's house. Also 137.23 feet easterly from monument No. 3 and about 17 feet southerly from a large beech tree. It is about 3 feet below the present surface of the ground and protected by one length of 15-inch vitrified pipe, which is covered with a two-inch spruce cover, over which there is about six inches of earth. Its northerly corner is slightly chipped, otherwise it is in good condition.

This monument was found August 21, 1913, by means of data given in the "Report of the proceedings of the New Jersey Boundary Commission appointed to locate and mark out by stakes and buoys the true boundary line between New York and New Jersey in lands under water in Hudson River, Bay of New York, Kill von Kull, and Arthur Kill or Staten Island Sound." Also by means of a random line survey connecting monuments Nos. 2, 3 and 5, made August 19, 1913. The calculations and measurements based on the above, to determine the position of monument No. 4, coincided within less than nine inches of the position of said monument as found.

Monument No. 6.

This monument is located at Tottenville, S. I., on land now a ship yard, belonging to Harry Cossey. It is 156 feet northwesterly at right angles from the northwesterly side of Cossey's corrugated iron saw mill; 9.8 feet southwesterly from the northeasterly side, or line, of said Cossey's saw mill produced, and about 129 feet southwesterly from his northeasterly bulkhead. It is about 3 feet below the present surface of the ground and protected by one length of 12-inch vitrified pipe, covered with a 5-inch yellow pine cover, over which there is about 6 inches of earth. It is in good condition.

This monument was found August 14, 1913, by means of the data shown on the "Revised Map of Pierhead and Bulkhead Lines for both shores of Arthur Kill or Staten Island Sound, from Raritan Bay to Storys Flats, as recommended by the New York Harbor Line Board, April, 1911," approved September 28, 1911. In reference thereto, it is gratifying to note that our random line survey of August 12, 1913, connecting monuments Nos. 5 and 7 and calculations and measurements therefrom, to determine the position of monument No. 6, coincided within less than 6 inches of the position of said monument as found.

Monument No. 13.

After quite an extensive survey connecting monuments Nos. 12, 14, 15 and U. S. H. L. monument "M" on Tufts Point and calculations therefrom, the theoretical, or recorded, position of monument No. 13 was found to be on land of the Philadelphia & Reading R. R. Co. among the tracks usually occupied by loaded coal cars at Port Reading, N. J.

On September 4, 1913, an attempt was made to find and locate monument No. 13 on the ground by means of the above survey and calculations and by direct measurements over the coal cars from our nearest survey station, with the result that it was not found, in consequence of its theoretical, or recorded, position being in or near the center of one of the many tracks fully occupied by loaded coal cars, which made the question of a further search by digging prohibitive.

In view of this fact it was deemed advisable to set another stone on the same range with Nos. 13 and 15 and designate it 13-A. Stakes were therefore driven on the above date for that purpose.

In making the above survey monument No. 14 was found to be covered with a stack of railroad ties. These were removed, the 18-inch tile pipe cleaned out and both monument and pipe protected by a suitable creosoted planked cover.

Monument No. 13-A.

This monument, granite, eight inches by eight inches by 3.3 feet long, lettered " N. Y.–N. J." on its northerly side and " No. 13-A" on its southerly side, is located at Port Reading, N. J., on land of the Philadelphia & Reading R. R. Co. It is in the same line, or range, with monument No. 15 and the theoretical, or recorded, position of monument No. 13 and distant 765.95 feet northwesterly therefrom. It is 27.65 feet southeasterly from an iron pump, 36 feet northeasterly from the northeasterly corner of a frame shack and 99.4 feet westerly from the southwesterly corner of another shack.

It was set September 8, 1913. In setting it, an iron disk 9 inches in diameter, three-quarters of an inch thick, with a one-quarter-inch hole drilled in its centre and coated with asphaltum, was used. The disk was first very carefully set in its proper position, in coal ashes, by means of the hole in its centre. Coal ashes and selected material was then carefully placed over the disk to an elevation of about five inches above it. The monument was then carefully set in its proper position directly over hole in centre of disk and with its top about three inches above the surface of the ground.

At the monument the following bearings were taken: N. 75° E. to chimney of the American Agricultural Chemical Co. (Liebig Works) and S. 82° E. to the northerly one of two water towers on land of the Philadelphia & Reading R. R. Co.

The theoretical, or recorded, position of monument No. 13 as used above is determined by computations by Mr. William B. Moss, Civil Engineer, of New York city (based on the U. S. C. S. station " Bogart ") and our survey connecting monuments Nos. 12, 14, 15 and U. S. H. L. monument " M " on Tufts Point.

Monument No. 24.

This monument is located in the borough of Roosevelt, N. J., on land of the Warner Chemical Company. It is 8.8 feet southwesterly from the northeasterly side, or line, produced and 7.4 feet southeasterly from the southeasterly side of the main brick building of the company and within a one-story corrugated iron cement shed formerly the old mud clay house. It is 323.27 feet northerly from U. S. monument " N " at the foot of Rahway avenue and at an angle of 68° 57′ 54″ in the northeast quadrant from monument " N " and Melvin's chimney on Staten Island. It is about 3 feet below the floor level of the corrugated iron cement shed and about 2 feet below the outside surface of the ground. It is protected by one length of 8-inch vitrified pipe, covered with a 6-inch yellow pine cover, over which there is about 6 inches of earth. It has its westerly corner slightly chipped, otherwise it is in good condition.

This monument was found September 5, 1913, by means of data from and computations by Mr. William B. Moss, Civil Engineer, of New York city.

Monument No. 37.

This monument was located on Buckwheat island in Arthur Kill, but, from measurements made on September 11, 1913, we find that it has been removed by the erosion of that portion of the island on which it stood.

Monument No. 37-A.

This monument, granite, eight inches by eight inches by 3.7 feet long, lettered " N. Y.-N. J." on its northerly side and " 37-A" on its southerly side, was located and set in concrete on Buckwheat island in Arthur Kill, on September 25, 1913, as follows: Seventy feet westerly from the position of monument No. 37 as defined on the " Revised Map of Pierhead and Bulkhead Lines for both shores of Arthur Kill or Staten Island Sound, from Raritan Bay to Storys Flats, as recommended by the New York Harbor Line Board, April, 1911," approved September 28, 1911, and at right angles with the line joining said monument No. 37 as above defined and monument No. 40.

The position of monument No. 37 as adopted and used in the location of monument No. 37-A with reference to other monuments, was as follows: In line, or range, with monument No. 33 on Chelsea, or Pralls island and U. S. H. L. monument " B " on Buckwheat island and distant 191.9 feet northerly from U. S. H. L. monument "A," also on Buckwheat island. This latter monument "A" was found to be 0.39 foot east of the said line joining monuments No. 33 and " B," which variation from alignment is very likely due to the dredging of the channel of Arthur Kill, which approaches nearer the southerly end of the island than it does the northerly end and hence its disturbing effects are greater at "A" than at " B."

Monument No. 40.

This monument is located at Bayway, N. J., on land of the Waclark Wire Company, near the mouth of Morse's creek, 5 feet northwest of high-water line of Arthur Kill.

At the monument the following bearings were taken; N. 40° W. about 203 feet to a high board fence along the southeasterly side of the road and N. 60° E. about 390 feet to stack of the Waclark Wire Company.

The upper part of the concrete surrounding this monument was found to be cracked and broken off in places, to such an extent as to warrant its repair with fresh concrete. Accordingly on September 9, 1913, the cracked and broken concrete was removed and the monument put in thorough repair with fresh concrete.

Monuments Nos. 48 and 49.

These monuments are both located at Bergen Point, Bayonne, N. J., on land of The Safety Insulated Wire & Cable Company.

No. 48 is within the frame building No. 28. It is 6.9 feet northwesterly from the southeasterly side and 21.5 feet southwesterly from the northeasterly side of said building No. 28. It is about 2.5 feet below the surface of the ground and is to be protected by the company, by a concrete casing 20 inches square on the inside and 32 inches square on the outside at the top and covered with a suitable cover. It has its corners and edges chipped and leans slightly to the northwest, otherwise it is in good condition.

No. 49 is 101.65 feet southeasterly from the southeasterly side of the brick building No. 1 and 109.8 feet northeasterly from the southwesterly side, or line, of said brick building No. 1 produced southeasterly. It is about 1.5 feet below the surface of the ground and is to be protected by the company, by a concrete casing 20 inches square on the inside and 32 inches square on the outside at the top and covered with a suitable cover. It is in good condition.

These monuments were found by means of data from and computations by Mr. William B. Moss, Civil Engineer, of New York city.

Monument No. 53.

This monument is located at Livingston, S. I., on land (right of way) of the Staten Island Rapid Transit Railway Company.

We find from the best information now obtainable that on or about August or September, 1895, this monument was removed from its original position by Mr. A. B. Proal, at that time engineer for the Richmond Light and Railroad Company, and reset about 23 or 26 feet northerly in line, or range, with its original position and the Tide Water Oil Company's chimney on Constables Hook, Bayonne, N. J., by means of a survey made for the purpose by Mr. William MacDonald; also that its position as thus moved and reset was subsequently recorded in Mr. John C. Payne's field book as 19.2 feet northerly from the northeasterly corner of the brick pump room of the power plant of the Richmond Light and Railroad Company, at Livingston, S. I., and 0.5 foot westerly from the easterly side, or line, of said brick pump room produced northerly.

This monument was found to be leaning badly to the west. Hence, on September 12, 1913, it was carefully reset in concrete in its recorded position as above. It is between the two main tracks of the Staten Island Rapid Transit railway and its top is about level with the top of ties of west-bound track.

The information as to the removal of this monument was obtained from Mr. A. B. Proal, now with the Robins Belt Conveying Company, with offices in the Park Row building, New York city.

Monument No. 56-A.

Mr. John C. Payne, secretary and engineer of the Riparian Commission of New Jersey, informs us that on September 3, 1904, this monument (granite) was carefully set in line, or range, with monument No. 56 and the Crude Oil Company's chimney on Constables Hook, Bayonne, N. J., and that its location was near the northerly side of Jay street, about opposite the junction of Stuyvesant place at St. George, S. I.

In constructing the retaining wall along the northerly side of Jay street, the borough authorities, after first carefully noting the position of the above monument, removed it. After the retaining wall was completed and on or about September 25, 1912, the said borough authorities carefully set or caused to be set a brass bolt in the northerly concrete sidewalk of Jay street to mark the identical position of the former stone monument, which was removed as above.

The present monument, No. 56-A, is therefore a brass bolt set in the northerly concrete sidewalk of Jay street about opposite the junction of Stuyvesant place, at St. George, S. I. It is 0.485 foot southerly from a drill hole and cut in the top of the coping of the retaining wall of Jay street, 37.59 feet northwesterly from a drill hole and cut in the northerly curb of Jay street, and 71.8 feet easterly from another drill hole and cut in the said northerly curb of Jay street, the said cuts in the northerly curb of Jay street being 103.53 feet apart.

MONUMENTS ON LANDS FROM HUDSON RIVER TO DELAWARE RIVER.

The monuments marking that part of the New York and New Jersey boundary line extending from the Hudson river to the Delaware river were repaired, restored, referenced, or reset, as follows:

Monument No. 17, or Road Monument No. 1, between Milestones V and VI.

On July 9, 1913, this monument was very thoroughly reset in concrete in its proper position directly over and about eight inches above the disk. Immediately above the disk a short piece of chestnut plank was placed for the protection of the disk. The hole was very wet, necessitating the digging of a sump hole and the use of a pump. The work was commenced at noon, July 8, and completed at noon, July 9.

Monument No. 24, or Road Monument No. 1, between Milestones VIII and IX.

On July 9, 1913, this monument was very thoroughly reset in concrete in its proper position directly over and about six inches above the disk. Immediately above the disk a piece of chestnut plank was placed for the protection of the disk. The hole was very wet, necessitating the digging of a sump hole and the use of a pump. The work was commenced at noon, July 9, and completed about 5 P. M. the same day.

Monument No. 25, or Road Monument No. 2, between Milestones VIII and IX.

On July 10, 1913, it was deemed advisable to test this monument for alignment, in consequence of its having been moved on October 10, 1910, about four feet westerly from its original position by Mr. C. Gurdes, assistant superintendent of highways of Orangetown, Rockland county, N. Y., coöperating with a similar official of New Jersey. It was accordingly tested for alignment by producing with a transit the line through monuments numbered 26 and 28 and found to be 0.3 foot too far north, which was considered to be of sufficient variation, or error, to warrant its resetting in true alignment, which was done on July 11, 1913. The work was commenced on July 10, at 8 A. M. and completed shortly after noon on July 11.

Monument No. 44, or Railroad Monument No. 1 (Erie Railroad), between Milestones XIV and XV.

By prearrangement with the officials and superintendent of the Erie railroad, Foreman Kelly and two trackmen of the railroad, on July 12, 1913, searched for and finally found this monument, which is of granite, six inches by six inches square.

It is situated between tracks numbered three and four of the Erie railroad at Suffern, N. Y., 6.35 feet east of easterly rail of track No. 4, 1.95 feet west of westerly rail of track No. 3 and 1.2 feet below top of tie. It is about 124.25 feet westerly from monument No. 43, 138.06 feet northerly from the easterly corner and 138.82 feet northerly from the westerly corner of back wall of railroad bridge over highway.

Its southerly corners and two of its edges were slightly chipped, otherwise it is in good condition.

The work was commenced about 8:30 A. M., July 12, 1913, and completed at noon the same day.

Monument No. 64, or Milestone XXVI.

On July 17, 1913, this monument (granite, six inches by six inches by 2.8 feet long) was very firmly set in concrete in its former position longitudinally, 157 feet easterly from monument No. 65, but 0.35 feet southwest of its former position transversely, to agree for alignment with a line passing through monument No. 63 and a point 2.01 feet southwesterly of monument No. 65. A search was made for the disk by digging to a depth of over five feet, but it was not found. Hence the resetting as above. The work was commenced in the morning of July 16, and completed in the afternoon of July 17, 1913.

Monument No. 70, or Road Monument No. 1, between Milestones XXIX and XXX.

On July 15, 1913, this monument was reset in its proper position directly over and about two inches above the disk. Immediately above the disk a short piece of chestnut board was placed for the protection of the disk. The work was commenced shortly after noon on July 15, 1913, and completed the same day.

Monument No. 78, or Railroad Monument No. 1 (Lehigh and Hudson River Railroad), between Milestones XXXII and XXXIII.

On July 15, 1913, this monument was very thoroughly reset in concrete in its proper position directly over and about nine inches above the disk, notwithstanding that the stone was in two pieces, the upper one being 2.2 feet long and the lower one 1.6 feet long. Immediately above the disk a short piece of chestnut board was placed for the protection of the disk. The work was commenced about 9 A. M., July 15, 1913, and completed at noon the same day.

Monument No. 83, or Milestone XXXIV.

On July 18, 1913, this monument (granite, six inches by six inches by four feet long) was taken up; the disk was found and very carefully reset in gravel about 0.8 foot lower than its former elevation. The monument was then very carefully reset in concrete in its proper position directly over and about 0.3 foot above the disk. Immediately above the disk a short piece of pine board was placed for the protection of the disk. The work was commenced in the morning of July 18, 1913, and completed at noon the same day.

Monument No. 84, or Milestone XXXV.

This monument (both stones; new, granite, six inches by six inches by four feet long, and old stone, an irregular slab) was found lying among the weeds alongside the lime ditch on lands of A. L. and F. L. Roy.

On July 18, 1913, a search was made for the disk, using certain data as to the location of the monument in possession of Mr. J. C. Payne, secretary and engineer of the Riparian Commission of New Jersey, namely, 15 feet northerly from the pin oak tree and 10 feet northeasterly from the line fence. With the point obtained by the above measurements as a centre, a hole five feet in diameter was carefully dug to the necessary depth, but the disk was not found in position. It was found, however, in the outer edge of the debris from the hole, indicating thereby that it had accidentally been dug up and thrown out without our knowing it.

On July 26, 1913, after a very careful survey had been made from monument No. 82 to monument No. 85, the disk was carefully reset in gravel, in our judgment practically in or very near its original position, as follows: 5,347 feet west of milestone No. 34 and 694.1 feet east of monument No. 85 and in a line passing through milestone No. 34 and a point 9.69 feet northeasterly from monument No. 85. This method of reëstablishing the position of the monument retains the recorded deflection angle of 0° 48′ south at milestone No. 35 at least as far west as monument No. 85, but necessitates a deflection of 1° 11′ 09″ south at milestone No. 34, at least from monument No. 82, instead of the recorded deflection of 1° 10′ south. The position of the disk as reset with reference to Mr. Payne's data is as follows: 16 feet northerly from pin oak tree and 10.5 feet northeasterly from the line fence. Immediately above the disk a short piece of chestnut board was placed for the protection of the disk.

The granite monument was then very carefully reset in concrete in its proper position directly over and about 0.5 foot above the disk. The old stone was also reset in concrete just west of the granite monument.

The recorded deflection angles above referred to may be found on page 40 of the " Report of the Commissioners on the Boundary Line between the States of New York and New Jersey," transmitted to the Legislature, March 24, 1884.

The work was commenced on July 18 and completed on July 26, 1913.

Monument No. 95, or Railroad Monument No. 1 (New York, Susquehanna & Western Railroad), between Milestones XL and XLI.

On July 29, 1913, this monument (granite, six inches by six inches) was very thoroughly reset in concrete in its proper position directly over and about 2.0 foot above the disk, notwithstanding that the stone was in two pieces, the upper one being 2.5 feet long and the lower one 1.5 feet long. Just above the disk a short piece of hemlock board was placed for the protection of the disk.

The work was commenced in the morning of July 29 and completed at noon the same day.

Monument No. 101, or Road Monument No. 3, between Milestones XLI and XLII.

On July 30, 1913, this monument (granite, six inches by twelve inches) was very thoroughly reset in concrete in its proper position directly over and about 0.3 foot above the disk, notwithstanding that the stone was accidently broken into two pieces, the upper one being 1.4 feet long and the lower one 2.7 feet long. Just above the disk a short piece of white pine board was placed for the protection of the disk.

The work was commenced shortly after noon of July 29 and completed about 5 P. M. of July 30, 1913.

Monument No. 107, or Milestone XLIV.

On July 31, 1913, this monument (granite, six inches by six inches by 2.4 feet long) was very thoroughly reset in concrete in its proper position directly over and about 0.7 foot above the disk. Just above the disk a layer of clay was spread, upon which a flat stone was laid for the protection of the disk.

The work was commenced in the morning of July 31 and completed in the afternoon of the same day.

This monument was originally 4.4 feet long, but in excavating it was found to be in two pieces, the upper one being 2.4 feet long and the lower one 2 feet long. In view of the fact that the old stone, a large irregular slab, was found to be very firmly embedded in stone and inclining very much to the east and because of the additional fact that the hole was quite wet, necessitating the digging of a sump hole and bailing to expose the disk, it was deemed unwise to attempt to lower the disk and reset the two pieces of granite stone, hence the above plan of resetting only the upper portion was adopted.

Very respectfully,

O. F. LEWIS, CIVIL ENGINEER,
Representing the State of New York.

CHARLES HOPPER, CIVIL ENGINEER,
Representing the State of New Jersey.

October 8, 1913.

REPORTS

ON

SURVEYS FOR PROPOSED CANAL CONSTRUCTION

Under Chapter 220, Laws of 1913

CHEMUNG CANAL

GLENS FALLS FEEDER

JAMAICA BAY-FLUSHING BAY CANAL

NEWTOWN CREEK-FLUSHING BAY CANAL

REPORT ON THE PROPOSED RECONSTRUCTION OF THE CHEMUNG CANAL.

State of New York,
Department of State Engineer and Surveyor,
Middle Division.

Syracuse, N. Y., *May* 11, 1914.

Hon. J. A. Bensel, *State Engineer and Surveyor, Albany, N. Y.:*

Dear Sir.— Attached herewith please find report on the proposed Chemung canal improvement, authorized by chapter 220, Laws of 1913.

Very truly yours,
E. STYRING,
Division Engineer.

INTRODUCTION.

As soon as possible after the passage of the act authorizing this survey, a reconnaissance was made from Seneca lake to the Pennsylvania state line near Waverly. After viewing the ground and studying the existing conditions, the following was evident: That but one route is available; that the only way to supply the summit level is by a feeder from the Chemung river at Corning; and that the Chemung watershed does not readily lend itself to storage for stream regulation.

The length of the proposed canal with its feeder is somewhat more than 50 miles and the watershed of the Chemung river is about 2,500 square miles. The amount apportioned for the Chemung Canal Survey was $11,000. Consequently it was evident that discretion must be used in determining the engineering methods that should be employed in order properly to investigate each part of the project and still keep the expense within the amount of money available.

The Barge canal extends southerly from Seneca lake to Montour Falls. As the proposed canal would form a continuation of this waterway, the survey was begun at the termination of the Barge canal in the village of Montour Falls. Thus proper alignment and datum was conveniently secured, and carried southeasterly to the Pennsylvania state line.

The time necessary to accomplish the field work was from May until December, 1913. In order to obtain an estimate of cost for legislative purposes by the month of February, office work was organized in such a manner as to obtain this information first. Consequently, drafting and detail work was postponed. By February 14 a brief report and an approximate estimate had been prepared. These were immediately submitted. Then the drafting and details were taken up. This work was completed and the office in Elmira closed May 15, 1914.

DIVISIONS OF REPORT.

The report is divided into the following parts:

HISTORY.
(1) Introduction.
(2) Chemung Canal.
(3) Junction Canal.
(4) Conclusion.

METHODS.
(1) Introduction.
(2) Survey.
(3) Borings.
(4) Maps.
(5) Diagrams.
(6) Computations.

WATER-SUPPLY.
(1) General Statement.
(2) Size of Locks and Prism.
(3) Seasonal Capacity.
(4) Water Required.
(5) Source of Supply.
(6) Storage Reservoirs.

ROUTE.
- (1) Special Features.
- (2) Description.

ESTIMATE.
- (1) Details.
- (2) Unit Prices.
- (3) Percentage of Rounding.
- (4) Summary of Cost.

Accompanying the report there are a map showing the project, a profile of the route and several diagrams illustrating certain hydraulic features.

HISTORY.

INTRODUCTION.

New York State is on the eve of possessing a gigantic system of waterways that will have a total length of 530 miles. From the central part of the state one route extends westerly to Lake Erie, another northerly to Lake Ontario, a third easterly to the Atlantic and a fourth southerly to end in that narrow body of water known as Seneca lake. In every direction except the last one vast waters are reached. To extend this southern arm is the project that New York is now contemplating in conjunction with the state of Pennsylvania. To bring navigation into the coal fields, and ultimately by the great Susquehanna to reach Chesepeake bay and the Atlantic, is now being considered. As this report deals with a canal from Seneca lake to the southern boundary of New York State, and thus traverses a portion of the contemplated route, it is deemed proper that some mention should here be made of the efforts expended in the past to do, on a small scale, the very thing that is at present proposed. Accordingly, a brief account of certain abandoned waterways will now be given.

CHEMUNG CANAL.

Early History.

That the navigable waters of New York are separated from the greatest river system of Pennsylvania by only a narrow divide was a matter of comment even in the earliest days. In 1779, when General Sullivan made his expedition against the six nations of Indians, he sent a special message to General Washington concerning the practicability of joining the waters of New York with those of Pennsylvania by an artificial channel across this divide. Washington later tried to interest Congress in a canal that would unite the two systems, but nothing further was done in his day.

Interest Renewed.

The next historical mention that this project receives is under the date 1812. At this time an engineer by the name of James Geddes was directed by the State of New York through its canal commissioners to make an examination of the route that such a waterway would take. He reported that the project was practicable and explained how it could be accomplished.

Navigation Company Incorporated.

In 1815 interest became so great in this connection between the water systems of New York and Pennsylvania that private enterprise decided to undertake the work. Accordingly a petition was presented to the New York Legislature by a body of men who desired to be incorporated under the name of "The Seneca and Susquehanna Lock Navigation Company." The amount of capital considered necessary was $300,000. This company was organized for the specific purpose of constructing a canal from Seneca lake to the Chemung river. It was proposed to enter the Chemung river at Elmira and carry out the project after the manner recommended by James Geddes. The right to incorporate was granted this company, but actual construction never was undertaken.

Renewed Interest.

The matter was revived with more determination in 1824. At this time a joint committee from the New York and Pennsylvania Legislatures viewed the route and reported favorably. In 1825 a New York law was passed which provided for a survey and estimate to be made of the proposed waterway. Accordingly James Geddes was again engaged. In 1826 he reported as follows: "To make the communication required, a canal should be constructed from Seneca lake to Elmira, a distance of eighteen miles, and a navigable feeder from Chimney narrows on the Chemung river to the summit level, thirteen miles, making a navigation by canal of thirty-one miles."

Appropriation and Construction.

On April 15, 1829, an act was passed authorizing the Canal Commissioners of New York State to construct what was to be known as the Chemung canal. The following limitations were specified by this act. The route laid down by Engineer Geddes must be followed and the cost of the canal and feeder must not exceed $300,000. Proposals were received from contractors during November, 1829, and in the spring of 1830 work was begun. The entire canal was ready for navigation in May, 1833, but owing to a disastrous flood the opening to regular traffic had to be postponed until the following October. The cost was $314,395. The amount sufficient to take care of the extra cost over the $300,000 was appropriated in 1832. The contractors were experienced men and the cost per mile of this waterway is said to have been the least of any of the State canals.

Description of Waterway.

The size and extent of the Chemung canal was as follows: The prism of both canal and feeder was 42 feet wide at the water surface, 26 on the bottom and had a depth of 4 feet of water. There were 43 locks, each 90 feet long between gates by 15 feet wide, having a total lockage of 516 feet. The total length of feeder and canal was 31 miles. The canal extended from Seneca lake to the Chemung river, or from Watkins to Elmira. The feeder left the Chemung river at Corning and entered the summit level at Horseheads.

Deterioration.

The locks of the Chemung canal were built of wood. This material proved to be extremely unsuitable for such purpose and constant repairing was necessary. In consequence of this traffic was frequently interrupted. When the Fall Brook railroad was built, paralleling the canal, the unreliability of this waterway was emphasized, and ultimately Watkins, at the foot of Seneca lake, became the harbor for coal transshipment. As will be explained later the waterways connecting the Chemung canal with the Pennsylvania coal fields fell into disuse. This handicapped canal traffic greatly, because coal had to begin its northward journey by rail and the natural inclination was to let it remain in the cars until its destination was reached, even though higher rates had to be paid for this convenience.

Another condition that hastened the decline of the Chemung canal was the unreliability of the summer flow of the Chemung river as a source of water-supply. As early as 1867 there is recorded serious trouble due to lack of water. It is said that during certain periods of low flow in the Chemung river the entire discharge of the stream at Corning was passed to the feeder. Still, even this was not sufficient to sustain the levels. This complete diversion was resorted to so frequently that the State of Pennsylvania made a vigorous protest. So serious did this lack of water for canal purposes become that an attempt was made to secure an adequate supply by means of storage reservoirs. Accordingly an examination was made of Lamoka and Little lakes in Schuyler county with a view to water being impounded by the aid of these natural basins. The engineer who made the investigation reported favorably. He estimated that 313,196,400 cubic feet could be stored upon these twin lakes by one low, inexpensive dam. This amount of water, the engineer stated, was equivalent to 110 lockages per day during navigation season. However, those interested in the welfare of the canal were never able to bring about the employment of these lakes as storage reservoirs. This uncertainty of water-supply continued to handicap the movement of boats and thus to assist materially in the deterioration of the canal.

Abandonment.

A history of the Chemung canal during the last twenty years of its operation would consist largely of the narration of numerous attempts to obtain adequate appropriations for its maintenance or improvement. Thoroughness and permanency seem to have been lacking in such work as was done. Apparently the repairs that were made consisted of just enough work to keep the canal nominally open, but still in such a state that the movement of boats was uncertain. The structures of the canal became more dilapidated as the years passed by and volume of traffic became less and less. Finally in 1878 the Chemung canal was closed and abandoned.

JUNCTION CANAL.

Early History.

The Junction canal was the official name of the connection between the Chemung canal and the North Branch canal of Pennsylvania. The first historical mention of this connecting waterway appears under the date 1839. In April of that year a committee from the Pennsylvania Senate came to Albany for the purpose of urging that such a canal be built. The object was to perfect navigation between the New York and Pennsylvania canal systems. Up to this date, 1839, traffic was obliged to use the Chemung river between Elmira and the state line and navigation was practical only during times of ample flow. The outcome of this conference with the Pennsylvanians was the enactment of a law by the New York Legislature, which read as follows: "The canal commissioners shall cause a route for the continuation of the Chemung canal to be surveyed, from its present termination near Elmira, . . . to the State line near Tioga Point, at the termination of the North Branch canal, and cause an estimate of the cost of said connection to be made and report to the next Legislature of this state at the opening of its session." Accordingly in 1840 a statement was submitted by the canal commissioners to the Legislature. From the engineer's report the following facts are noted: The lockage was 75 feet and the cost $398,988. However, owing to the deranged condition of the monetary affairs of the country at that time, the raising of money was especially difficult and the canal project was allowed to rest.

Junction Canal Company.

In 1846 the prolongation of the Chemung canal was again considered, with the result that private enterprise took up the matter. Several business men of Elmira became incorporated as the Junction Canal Company with a capitalization of $500,000. However, actual construction work was not undertaken by this company until March, 1853. By the end of the following year the canal was nearly complete, but navigation throughout its length was not possible until 1858.

Description.

The size of this waterway is reported to have been as follows: Sixty-five feet wide at the water surface, 26 feet on the bottom and 4 feet in depth. There were 11 wooden locks of 90 feet by 17 feet, having a total lockage of 75 feet. Three dams and two aqueducts were among the structures. The total cost of construction was $530,637.

Deterioration and Abandonment.

The Junction route proved to be an important tributary to the canals of New York and the company is said to have made money by its operation. However, in 1865 the North Branch canal of Pennsylvania was almost totally destroyed by flood and, although attempts were made to rebuild it, this connection with the coal fields was never again in operation. Instead of a water route, a railroad was built along the berme bank of the crippled North Branch canal. The coal traffic having been diverted, the business of the Junction canal dwindled year by year until 1871. During that year this waterway was closed and abandoned.

CONCLUSION.

If the Chemung, Junction and North Branch canals had been properly cared for and thus preserved as a unit, there is no doubt that their effect upon the development of the territory through which they passed would have been even more marked. That their usefulness might have been prolonged to the present day is possible, if ordinary business sagacity had been used in the management of these waterways.

At present a movement for cheaper transportation is sweeping the entire world. Larger and more serviceable canals are being built. Efforts are being made to erect structures that will possess both permanency and utility. Legislative bodies are framing laws that will compel the railroads to coöperate with the waterways. The questionable methods of competition, that have been resorted to in the past to discourage transportation by water, will be abolished. Shippers will be enabled to take advantage of the low rates made possible by reconciliation between rail and water transportation. In Europe, adjustments have been made that have resulted not only in marvelous general prosperity but have ultimately benefited the railroads themselves on account of the vast increase in the movement of merchandise. In view of the present determination to take advantage of the transportation possibilities on this side of the Atlantic, there is predicted an era of unprecedented commercial activity.

METHODS.

Introduction.

In order to investigate a canal project, suitable topographic maps are indispensable. A survey was made to obtain data for preparing such maps. Borings were taken to ascertain the character of the underlying material. Since the manner of collecting this necessary information and the methods of using the resulting maps are indicative of the extent to which a project has been investigated, a brief description of the system employed on this work will now be given.

Survey.

Stadia measurements were used throughout. In running the base lines, great care was used in checking the reading of the distance. Special precautions were employed to eradicate cumulative errors of all kinds. The same transit was used for base line work throughout the entire route. During the regular work in the field, a number of closed traverses were run. The error of closure for each of the traverses was computed. The degree of accuracy that was thus manifest as the work progressed, proved that the methods in use were satisfactory.

The azimuth of the base line was checked in the usual manner by Polaris observations. The elevations of the stadia stations were verified by a circuit that was run with a wye level.

The datum for the levels is the same as that employed in Barge canal construction. At Montour Falls the constant difference between this datum and that of the U. S. Geological survey was determined. When the lines of levels were being run throughout the length of the route, the permanent bench marks, which the Federal government has so admirably established, were touched upon. They served as a most convenient check on the levels of this canal survey.

Borings.

Wash drill borings were taken at intervals along the route. Where the character of the subsoil would permit, an unwashed sample was obtained. To lift such a core, the casing is driven without the use of a jet and withdrawn in such manner as to retain the compact material that it contains. Then the sample is removed from the interior of the casing and can be examined without having been submitted to usual washing process that destroys to a large extent the original character of the material.

As the drill holes were necessarily far apart, supplementary information was obtained from the wells and excavations along the route.

Maps.

The maps of the ground over which the proposed canal would pass, were plotted to a scale of 200 feet to the inch. The topography was such as could be clearly shown by 5-foot contours. On sheets of this size it was possible to show in a suitable manner all buildings, roads, streams and other essential features, both artificial and natural.

To facilitate accuracy and speed in plotting the base line upon these maps, a system of coördinates was employed. The origin of the system was chosen in such a manner that the position of all characteristic points could be verified by comparison with the topographic sheets of the U. S. Geological Survey. The possibility of any large error was thus eliminated.

An accurate and complete topographic map of suitable scale enables work to be done with speed and assurance that would be impossible without the aid of such a map. By thus having on paper a summary of the actual field conditions, the most feasible route for a canal was laid down and a sufficiently precise estimate was compiled without any additional field measurements.

Diagrams.

In order to examine the flow of the Chemung river with the view of ascertaining its adaptability for supplying water for navigation purposes, a diagram of the daily discharge of this stream was plotted for each year during which it has been gaged. As these hydrographs were necessarily on large sheets, it is evidently inconvenient to attach them to this report. Consequently, a summary was made of the daily flow by plotting the average for each month. The resulting diagram is labeled the " Mean monthly discharge." This and other diagrams mentioned below will be found attached to this report.

To determine run-off from rainfall records on the Chemung watershed, a diagram was constructed for average conditions during each month of the year. A curve that represents the general average of a number of other watersheds was drawn upon these monthly diagrams. By comparison, the rainfall run-off characteristics of the Chemung watershed are emphasized.

To indicate briefly the yield of the Chemung watershed during the last twenty-three years, a diagram was constructed to show the inches of run-off that occurred each year. As the amount of water that would be available for storage in reservoirs was the object in view, the inches of run-off that occurred during the " storage period " therefor are shown separately.

In order to show graphically the percentage of the time during which the natural flow of Chemung river is reliable as a source of water-supply, two curves have been plotted. One for the year 1909 and another for the entire period during which actual gagings are available. When the river is flowing less than 500 cubic feet per second, no water should be diverted, and accordingly the line representing this flow has been labeled.

Computations.

The quantity of excavation was obtained by plotting a sufficient number of cross-sections and determining the area within the prism lines by the use of a level area table. In order to obtain the depth of cutting with which to enter the table, the following method was used. A fine thread was streached horizontally across the plotted section and shifted vertically, meanwhile keeping the thread parallel to the level lines on the paper. When a position was found where there was apparently as much " cut " above as " fill " below the thread, the elevation of an equivalent level surface was obtained and the average depth for use in the table deduced. In practice, this operation takes but a few seconds and saves a vast amount of planimeter operation in an extensive preliminary estimate. The accuracy of each computer was checked until he became sufficiently skillful.

Embankment was computed by means of a suitable table of areas. Cost curves were constructed from Barge canal construction. The locks, bridges and movable dams were estimated by the aid of these curves. The quantities in the other structures were computed and their cost obtained by the application of suitable unit prices.

WATER-SUPPLY.

GENERAL STATEMENT.

The summit level of the proposed canal would be about five miles in length. There would be 17 levels depending upon it for water, 14 of which would be fed from the north end and three from the south end of this summit level. In mentioning the number of levels that must be supplied, it will be noted that the pools to be formed in canalizing the Chemung river have not been counted. In studying the water-supply problem it has been deemed fair to consider that these pools would be sustained by the natural flow of the stream when this flow has been supplemented by the water that would be passed southerly from the summit level during the lockage of south-bound boats. In accord with this assumption attention has been chiefly confined to that portion of the canal which is strictly an artificial channel. Consequently, various losses of water have been computed for the stretch between Montour Falls and the Chemung river.

SIZE OF LOCKS AND PRISM.

The locks and prism have been estimated as being of standard Barge canal size,— that is, lock dimensions as follows: 328 feet long, 45 feet wide and 12 feet of water on sills. The maximum lift among the locks north of the summit level would be 33 feet and south of it, 15 feet. The normal cross-section of the water prism has the following dimensions: 123 feet wide at the water surface, 75 feet on the bottom, 12 feet deep and the slope of the sides, 2 horizontal to 1 vertical. These dimensions give a sectional area of 1,188 square feet and a wetted perimeter of 128.66 feet. In short levels, these dimensions are sometimes increased where storage is desired for filling the locks, and where room is very scarce, vertical walls are used and the width at the water surface reduced to 75 feet.

SEASONAL CARGO CAPACITY AND OTHER ASSUMPTIONS.

For purposes of computation a cargo capacity of 2,000,000 tons during a navigation season of 210 days was assumed. Although the locks can accommodate 3,000 tons per lockage, it is reasonable to consider 1,000 tons as passing, in order to determine the number of lockfuls of water required. To avoid figures of unnecessary refinement, the volume of a lock chamber was taken as 328′ x 45′ x the lift.' Also, to simplify matters, it was assumed that traffic would occur in such a manner that every boat passing through the summit would draw from this level two locks full of water. One lockful is used to get into the summit level and another to leave it. Consequently, the amount of water that would be used in passing 1,000 tons over the summit level is equal to the volume required to fill the 33-foot lock at the north end and the 15-foot lock at the south end.

AMOUNT OF WATER REQUIRED.

Items of Consumption.

In computing the amount of water required for operating the proposed canal, the following were considered as the principal items of consumption:

The volume necessary (1) to fill the prism, should it be emptied for any reason.

(2) To replace losses due to evaporation, percolation and absorption.

(3) To take care of leaks around lock-gates and valves.

(4) To make up such portion as would be lost over spillways.

(5) To furnish power for operating valves, gates and capstans.

(6) To supply water for the lockage of boats.

The detail computations are shown in the estimate which forms part of this report. Consequently, only a brief description of the method is considered necessary here.

Item No. 1. (Filling the prism.)

The volume necessary to fill the prism of the canal and feeder was computed. As the amount consumed in one day was the basis of computation, this item was distributed throughout the navigation season as so much per day. This filling of the prism would probably occur but once during a season. However, after the entire length of the canal has been drained off, it is considered that during the first month subsequent to such filling a loss of a prismful of water will result. These two prismfuls of water are in addition to the normal loss by percolation or seepage.

This item was estimated to be 1,250,000 cubic feet per day.

Item No. 2. (Losses *via* surface, sides and bottom of prism.)

Evaporation, percolation and absorption losses were allowed as a 4.5-inch decrease in depth per day over the entire water surface of the prism. This figure was arrived at by a study of the extensive measurements taken on the Erie canal during the year 1900. On the modern canals of France and Germany the loss from seepage is from 1.5 to 2.0 inches per day. From laboratory experiments it is recorded that aquatic vegetation returns to the atmosphere about one-quarter as much water as is evaporated by a free water surface of equal area. From measurements taken during the summer of 1900 the greatest loss in one day by evaporation was 0.25 of an inch. However, from a study of conditions that might occur on the proposed canal, 4.5 inches was considered sufficient to cover fully the total loss from evaporation, percolation and absorption.

This item was estimated as 5,700,000 cubic feet per day.

Item No. 3. (Losses around lock-gates and valves.)

Leakage around lock-gates and valves has been estimated at widely different values by European and American authorities. From recent observations on the completed locks of the Barge canal it is apparent that such losses are smaller than they were around the older structures. In fact, it is considered fair to assume the valves as practically water tight. However, around the lock-gates there is always some leakage. As a basis for computation, let it be assumed that there is an opening along the sill or the miter-post of each leaf of a pair of gates. Suppose these openings are each 0.25 of an inch wide by 9 feet long and are under a head equal to the lift of the highest lock. The volume required to make up the leakage through such openings in each series was computed and a rough determination was thus obtained.

This item was estimated as 1,250,000 cubic feet per day.

Item No. 4. (Loss over spillways.)

The loss over spillways was considered as being less than that shown by the data collected during the canal operations of former days. The use of the telephone by lock-tenders and others engaged in feeding levels will prevent the old time excessive waste of water to relieve "drowned" levels. The automatic spillways of the siphon type, which have been installed on the Barge canal, will also assist in minimizing this loss. These spillways no doubt will ultimately be equipped with a device to transmit a signal to the men in control of the feeding, whenever the level approaches the stage where overflow is pending. When modern conditions were considered in conjunction with available data that necessarily was collected under the old regimen, a flow of 28 cubic feet per mile per minute was deemed as ample to represent the loss over spillways.

This item was estimated as 800,000 cubic feet per day.

Item No. 5. (Losses of water in generating power.)

Water for furnishing power to operate lock machinery was estimated on the basis that 20 horse-power would be sufficient to operate the gates, valves or capstans. The time that such power would be in use during each lockage was considered as 6 minutes. On account of the unfavorable conditions under which water wheels would necessarily be, when installed as part of the machinery of a lock, a rather low efficiency was assumed for the turbines subject to such intermittent operation.

This item was estimated to be 100,000 cubic feet per day.

Item No. 6. (Losses by lockage of boats.)

The water necessary for the lockage of boats was computed on the basis of 2,000,000 tons cargo capacity. This tonnage would cause 10 fillings per day of the highest lock on either side of the summit level. On the north end the highest lift is 33 feet and on the south, 15 feet. Each of these locks must be filled once in in order to pass 1,000 tons through the summit level. Computations were made according to these assumptions.

This item was estimated as 7,100,000 cubic feet per day.

Summary of Items.

	Cubic feet per day
No. 1. Filling the prism	1,250,000
No. 2. Losses due to evaporation, etc	5,700,000
No. 3. Leakage around lock-gates and valves	1,250,000
No. 4. Losses over spillways	800,000
No. 5. Power for lock machinery	100,000
No. 6. Water for lockage of boats	7,100,000
Water required per day	16,200,000

This amount is equal to a constant flow of approximately 200 cubic feet per second.

SOURCE OF WATER-SUPPLY.

Pool and Feeder.

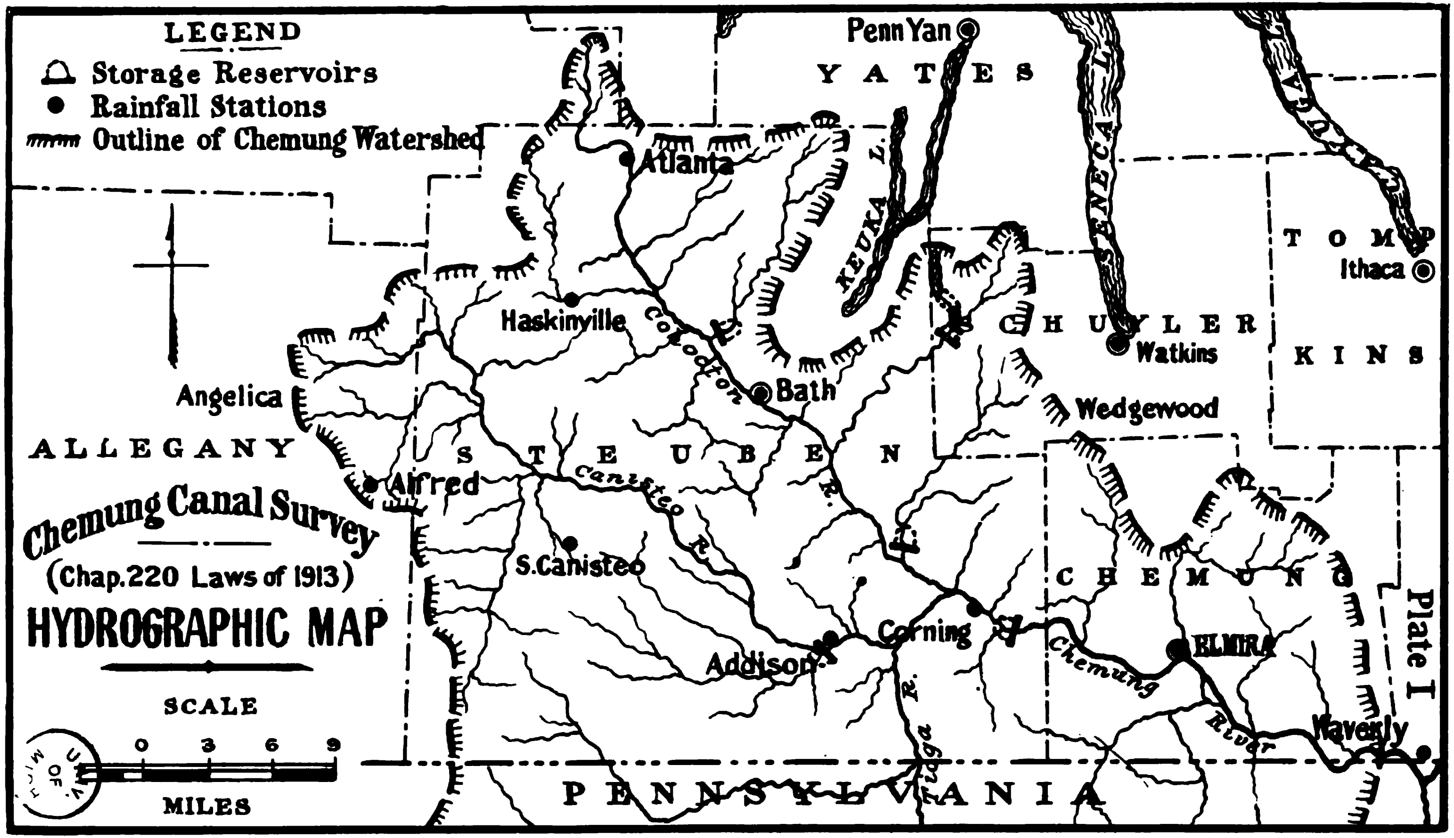
The Chemung river is the only available stream possessing a drainage basin of sufficient area to supply the large amount of water that is necessary to operate the proposed canal. There is an area of about 100 square miles that naturally drains into the summit level. This source has been considered on the side of safety, but has not entered into the estimate.

In order to bring water from the Chemung river to the summit level, a feeder must be extended to a pool near Corning. A movable dam of the bridge type would be installed to control this pool. This sort of dam in times of flood will leave an unobstructed channel. With such a structure it is obvious that no high water damage would result. However, at such times, when a pool is necessary, by lowering the gates of the dam a level of sufficient elevation can be maintained to pass water across the low ridge that lies between Corning and the summit level. In planning the feeder from this pool, the water surface was kept several feet below that of the abandoned feeder, which formerly extended along the route that any such channel must take. It was deemed advisable to follow the alignment of this old feeder as nearly as possible for the following reasons: The abandoned channel possesses wonderfully compact embankments, that would be a barrier against overflow. By excavating in the old bottom, the surface of the new feeder can be kept nearer the summer level of the ground-water table and thus reduce seepage losses as well as the attendant flood damages. At the lower end of the new feeder the drop of about 25 feet, which was overcome by locks in the former navigable feeder, will be taken care of by an inclined concrete flume. A structure similar to the one planned at this point is used on the Trenton Falls feeder.

Description of Chemung River.

The Chemung is formed a few miles above Corning, N. Y., by the union of the Tioga, Canisteo and Cohocton rivers. It flows

Plate I



UNIV. OF MICH.

southeasterly through Elmira and crosses the Pennsylvania state line near the village of Chemung, N. Y. After flowing about two miles in Pennsylvania, it returns to New York state and traverses a loop of three miles in length; then it finally crosses the line into Pennsylvania near Waverly, N. Y. The Chemung river is a tributary of the Susquehanna and is about 40 miles in length, 30 miles of which is in New York state. The grade of the Chemung river bed is rather uniform and averages four feet of fall to the mile. A series of small rapids of two or three feet drop and a chain of pools, go to make up the river throughout its length. The Chemung has an extensive flood plain and frequently divides itself into several channels. Large islands are thus formed in some instances, but in general low, gravely bars are the result. The banks are from five to ten feet above low water and are composed largely of clay. The water surface of the Chemung river has been known to rise 15 feet above its low-water elevation. The discharge varies from about 100 or 200 cubic feet per second during ordinary low water to 40,000 during the average flood. The maximum freshet on record occurred in June, 1889. The discharge at this time was estimated at 138,000 cubic feet per second. Francis Collingwood is authority for these figures. This famous engineer, in his report to the city of Elmira concerning flood protection, mentions the phenomenal rainfall that caused this extreme flood. The extensive dikes and concrete walls, that have been built at so many points along the Chemung river as a protection against floods, testify that this river has manifested its torrential character in a manner which convinced property holders that protection is necessary.

Watershed.

The topographic features of the Chemung watershed are as a rule broad and bold. Hills rise to a height of several hundred feet within a short distance on either side of the river channel. The tributaries are ramifying and uniformly distributed, though not numerous. Dry gulleys and flood channels are common. Many of the smaller creeks are intermittent. The upland plateau, which constitutes a large percentage of the catchment area, is wooded to some extent, but the soil is as a rule impervious. Few lakes or marsh areas are present. In fact, conditions on the Chemung watershed combine to produce such an extremely rapid run-off that necessarily long periods of low-stream flow must follow.

The entire drainage of the Chemung river above its mouth is 2,520 square miles and that portion above Corning is 1,950 square miles. With a maximum discharge that is one thousand times greater than the minimum, it is evident that the Chemung, for a stream with a large drainage area, is subject to uncommon changes in its flow. That this flashy nature is due largely to the character of its watershed is shown graphically by diagrams which form a part of this report (Plate II). On these diagrams a curve showing the relation of run-off to rainfall for each month of the year is plotted for the Chemung watershed for a period of ten years. On the same sheet is plotted an average curve derived from extensive data collected on other watersheds throughout the eastern states. By a comparison of these curves, the one for the Chemung shows that this watershed possesses retentive powers that are remarkably feeble. Precipitation, except when existing in the form of snow or ice, does not remain long on the impervious, semimountainous area, that forms the Chemung drainage basin.

No Diversion from Chemung River during Low-Water Period.

A flow of less than 500 cubic feet per second has been considered as low water in the Chemung river.

From a study of Plates III, IV and V and from an inspection of the computed flow, as far back as suitable rainfall records are obtainable, it has been determined that no reliance should be placed upon the natural flow of the Chemung river, when the necessary draft of 200 cubic feet per second for canal operation is contemplated. Consequently, storage reservoirs have been estimated of sufficient capacity to supply a constant flow of 200 cubic feet per second. The water to fill these reservoirs will be impounded during times of ample, or flood flow, and later passed to the pool at Corning *via* the Chemung and its tributaries, as required by the needs of canal operations.

Flood Heights Lessened.

As the storage reservoirs would control and impound in times of freshet the discharge of several of the most torrential of the

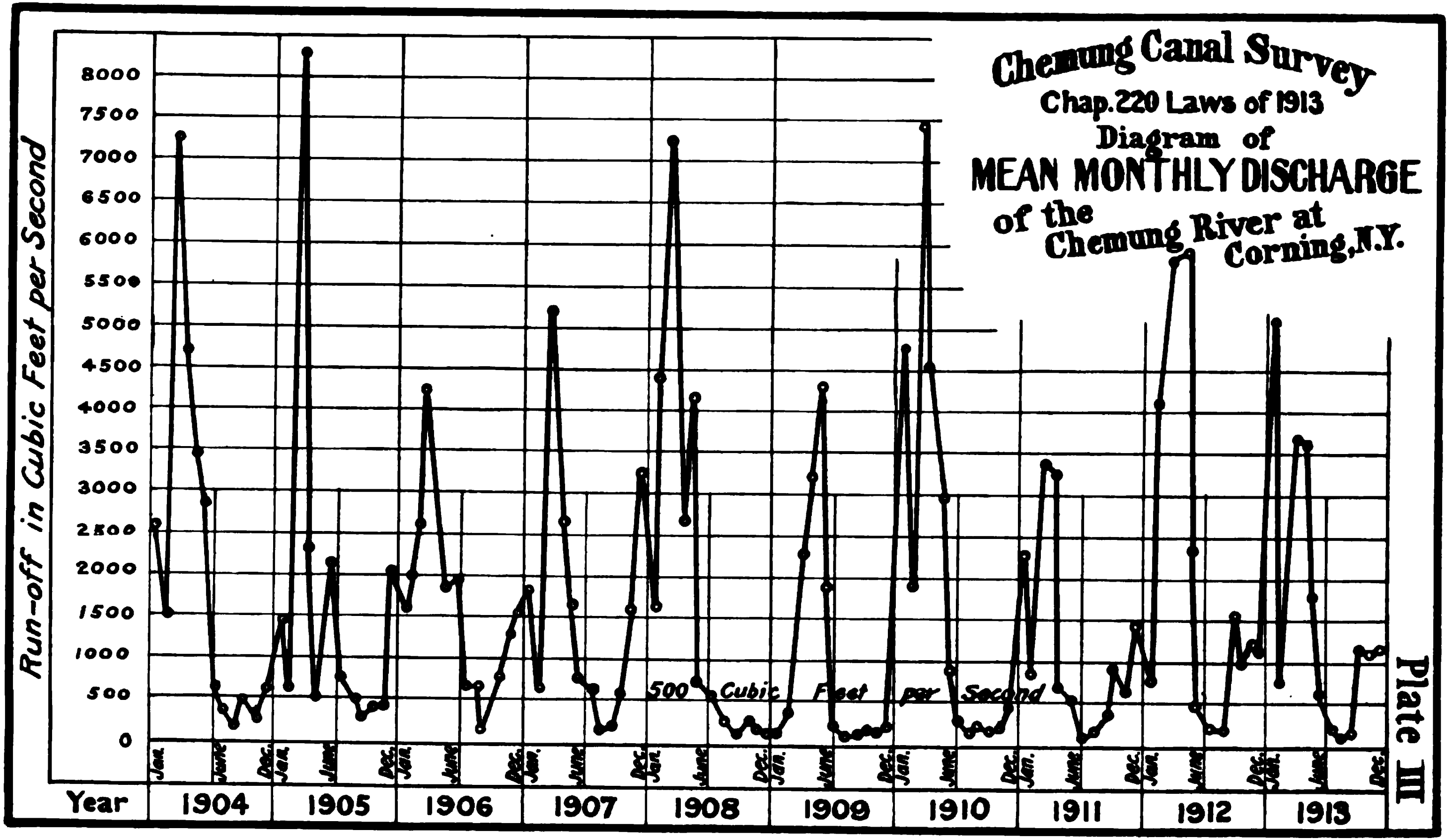


Plate III

Chemung Canal Survey
Chap. 220 Laws of 1913
Diagram of
MEAN MONTHLY DISCHARGE
of the Chemung River at Corning, N.Y.

Plate IV

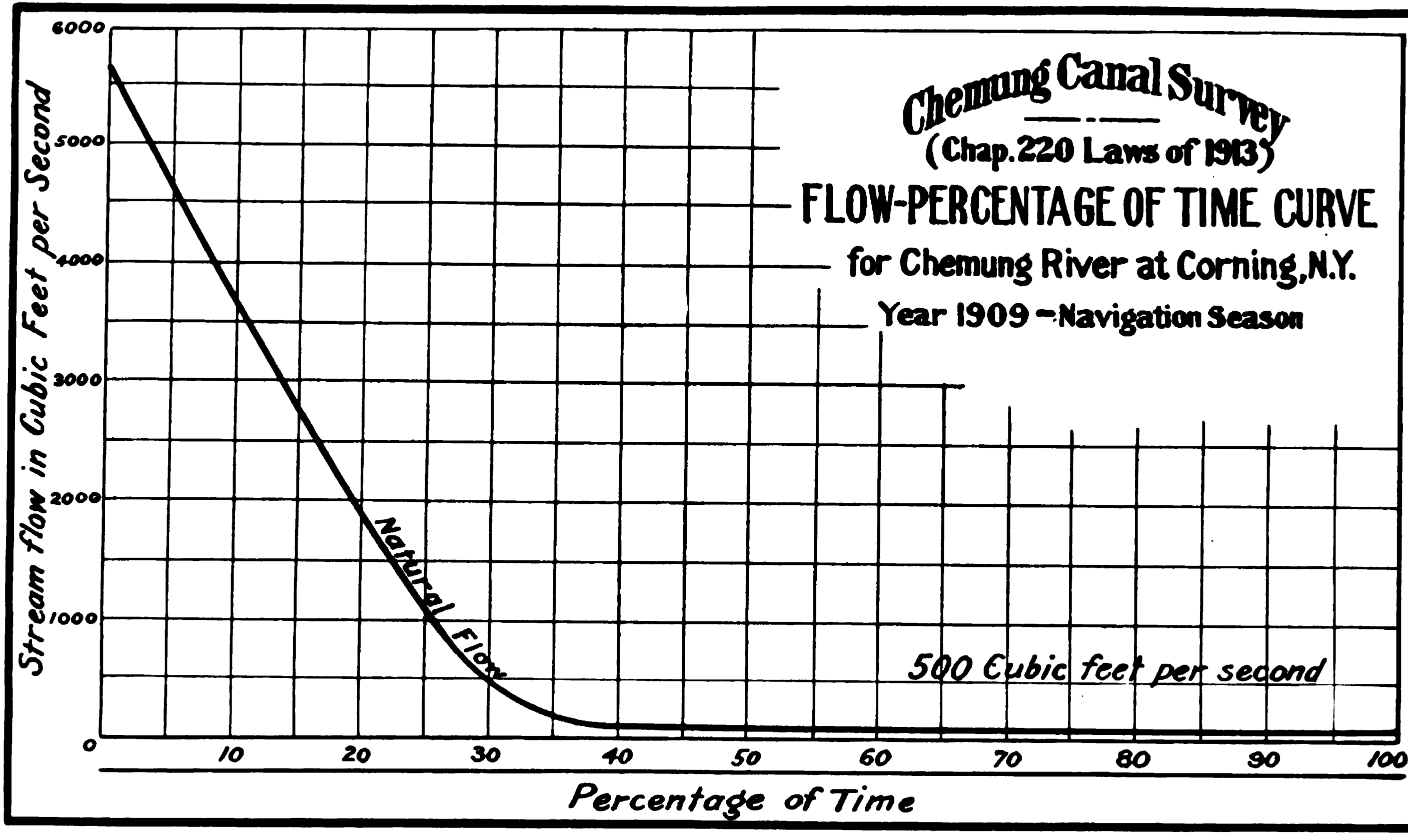
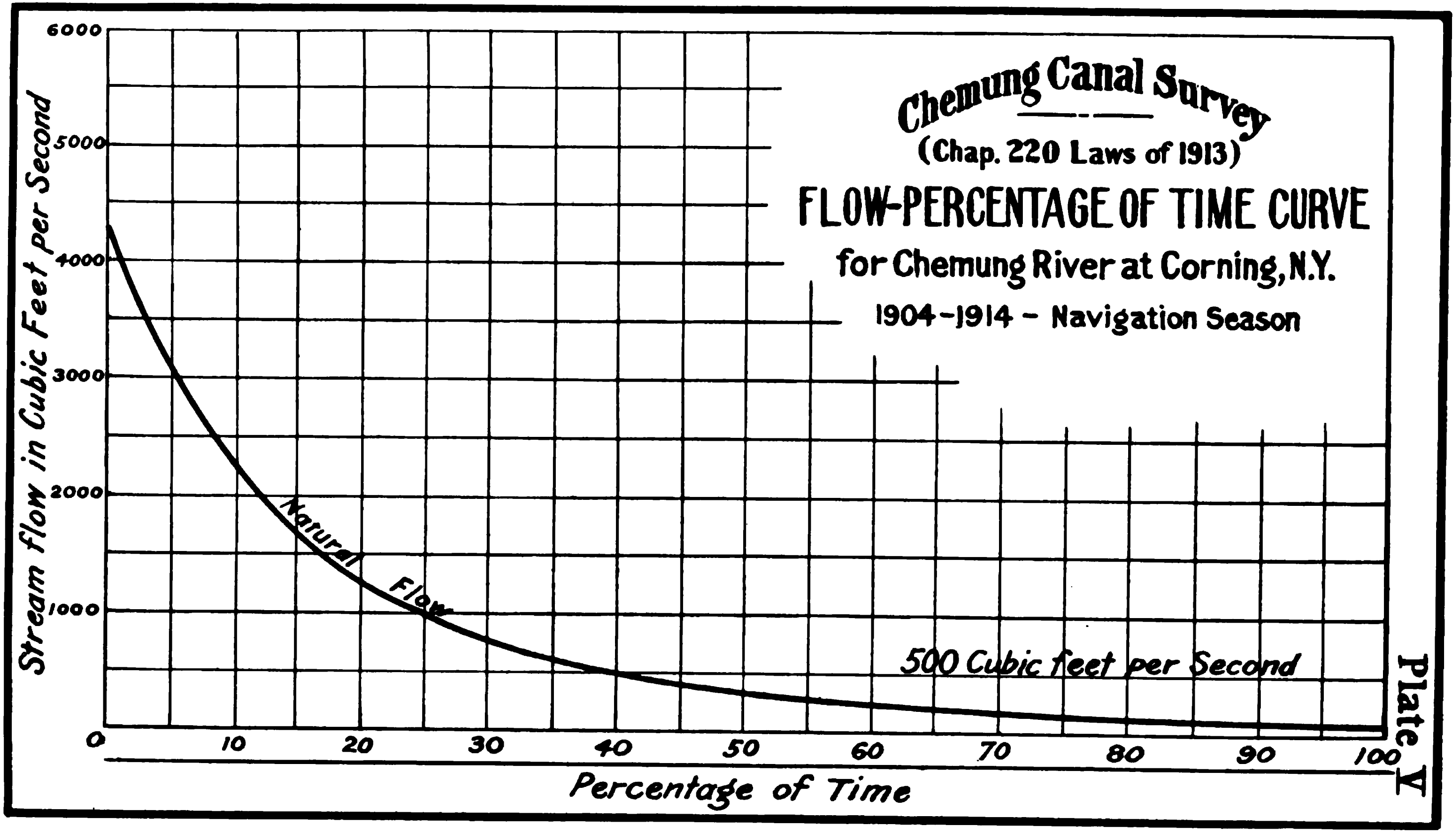

Chemung Canal Survey
(Chap. 220 Laws of 1913)
FLOW-PERCENTAGE OF TIME CURVE
for Chemung River at Corning, N.Y.
Year 1909 – Navigation Season
Natural Flow
500 Cubic feet per second
Stream flow in Cubic Feet per Second
6000
5000
4000
3000
2000
1000
0
10
20
30
40
50
60
70
80
90
100
Percentage of Time

Plate V



Chemung Canal Survey

(Chap. 220 Laws of 1913)

FLOW-PERCENTAGE OF TIME CURVE

for Chemung River at Corning, N.Y.

1904–1914 – Navigation Season

Chemung's tributaries, it is reasonable to expect the extreme flood heights will be lessened. By thus preventing the uppermost feet of rise during high water, often an otherwise uncontrollable flood is kept within the channel.

Run-off Available for Storage.

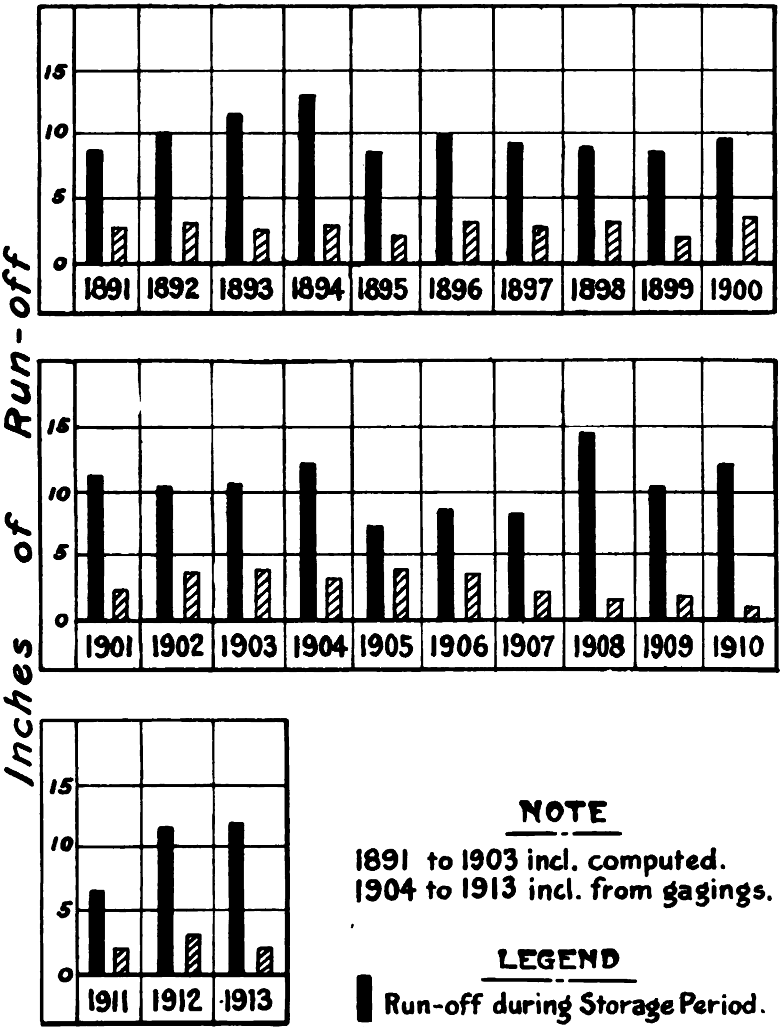
To estimate properly the cost of the storage reservoirs that would be necessary to impound the required water, a study of the yield per square mile of the Chemung watershed is imperative. As precipitation is measured by inches of depth, so it is found convenient to express run-off from a drainage basin in the same unit. Of the total amount of water that falls, a large percentage does not take the form of run-off, but is "retained" by a watershed. Evaporation and other natural phenomena return this portion to the atmosphere, but it is never available for storage. The method for computing the minimum yield per square mile of the Chemung watershed will now be outlined.

From the year 1903 to date actual gagings of the Chemung river are available. Monthly rainfall records from 1891 to date have been obtained for five characteristic stations on the Chemung watershed. Beginning with January, 1903, and considering every month of January to date, the inches of rainfall were plotted as abscissas and the resulting run-off as ordinates. A smooth curve that represents the average relation of rainfall in January to run-off in January, as occurring on a number of other watersheds of the eastern states, was drawn upon the same sheet. The position of an average curve for the Chemung watershed was determined among the plotted points. To do this, the points were connected and the desired curve found graphically. However, the general average curve was considered to some extent in shaping the curve for the Chemung watershed. Also the following test was applied. The total inches of rainfall and the total inches of run-off representing the aggregate of each quantity for all the months of January from 1903 to date was divided by the number of months under consideration. The result was the numerical average. By plotting this numerical average of the January rainfall and its resulting run-off, a check on the placing of the curve was obtained. The curve for each month was checked in this way. The position of this average is shown on the diagrams by two small concentric circles. When a curve showing the average relation of run-off to rainfall for each month during the year was obtained, attention was given to the compiled rainfall data extending back to 1891. Five stations on the Chemung watershed were used in computing the average rainfall for each month. From the known monthly rainfall data the corresponding amount of run-off for each reading was determined by means of the curve that was made especially for the month under consideration and for the Chemung watershed. These curves are described above. In this manner the run-off of the Chemung river was studied as far back as rainfall records were available.

Minimum Run-off.

It is notable that the run-off for any particular month is apt to be due to precipitation that has occurred during the previous month or months. In this case this precipitation has been stored in some manner on the watershed. This is particularly true in case snow or ice has been formed, because simply a rise in temperature may then cause excessive run-off. At any rate, the minimum for any one month means little. Consequently, the least run-off during a certain year or portion of a year is sought when storage problems are dealt with. The water year is divided into three periods, namely, the storage, the growing and the replenishing periods. Although the entire year was studied, attention was given mostly to the total run-off that occurs during the storage period. For the Chemung watershed, December, January, February, March, April and May are considered as comprising the storage period. The results of the run-off investigations from 1891 to date are shown concisely by the diagrams on Plate VI. For use in the storage computations, six inches was adopted as the minimum depth of run-off on the Chemung drainage basin. This gives a yield of 13,939,200 cubic feet per square mile during the storage period of the water year. Having determined the minimum yield per unit area of the Chemung watershed, attention will now be turned to the available sites for storage reservoirs.

Plate VI



NOTE

1891 to 1903 incl. computed.
1904 to 1913 incl. from gagings.

LEGEND

▮ Run-off during Storage Period.
▨ Run-off during remainder of Year.

Chemung Canal Survey
Chap. 220 Laws of 1913

RUN-OFF DIAGRAM

Chemung Drainage Basin above Corning, N.Y.

STORAGE RESERVOIRS.

Cooper's Plains.

Description. About six miles above Corning, what is known as Mead's creek empties into the Cohocton river. The valley of this creek contains a storage reservoir site which is about a mile from the railroad station, known as Cooper's Plains. At this site a dam of about 1,300 feet in length with an average height of 50 feet will store 873 million cubic feet of water. From the watershed of the creek at this point, 67 square miles of drainage area are available and the storage season will yield 930 million cubic feet.

Cost. The total cost of this reservoir was estimated at $596,966.

Tuscarora.

Description. On Tuscarora creek, near the village of Addison and about 14 miles above Corning, a storage site is available. The creek above this point has a drainage area of 120 square miles and would yield 1,600 million cubic feet during the storage period. In the valley of the creek about a mile above the village of Addison there is a site for a dam. At this site, 1,350 million cubic feet could be stored by a dam 1,600 feet long with a maximum height of 90 feet at the spillway.

Cost. The total cost of this reservoir was estimated at $1,248,628.

Lamoka.

Description. In Schuyler county there are two bodies of water known as Lamoka and Little lakes. These lakes drain into the Cohocton river at Savona and possess a water surface of 2.27 square miles. Their distance from Corning is 24 miles and the area that drains into these lakes is 42 square miles in extent. These bodies of water might be called twin lakes, as there is only a slight difference in elevation between their surfaces and they are connected by a short, sluggish stream. At the lower end, near Bradford, there is a good site for a storage dam. By a low dam, 1,200 feet in length, the yield of the drainage area, or about 600 million cubic feet, could be stored.

Cost. The total cost of this storage was estimated at $340,992.

Kanona.

Description. About 24 miles above Corning, near the village of Kanona, there is a storage reservoir site. A dam can be built at a narrow part of the valley of Five-Mile creek, near the hamlet called Jordan. Above this point there is an area of 62 square miles of drainage, which would yield 840 million cubic feet. A dam necessary to impound this amount of water would be 1,300 feet long and have a height of 50 feet at the spillway. A small railroad operates in this valley and some relocation would be necessary.

Cost. The total cost of this reservoir was estimated at $636,601.

Cost Comparison.

In order to compare the size and cost of the storage reservoirs proposed for the Chemung watershed, there is tabulated below data concerning a few well-known projects in New York state.

NAME OF RESERVOIR.	Capacity in millions of cubic feet.	Cost per million cubic feet.
Delta	2,700	$472
Hinckley	3,400	350
Genesee (proposed)	7,700	312
Hawkensville (proposed)	5,300	534
Higley Mountain (proposed)	5,200	260
Coopers (proposed)	873	684
Tuscarora (proposed)	1,350	925
Lamoka (proposed)	596	572
Kanona (proposed)	840	758

Summary.

To supply the proposed canal 3.66 billion cubic feet of storage has been estimated as sufficient. This amount of water is equivalent to a constant flow of 200 cubic feet per second during navigation season.

Four storage reservoirs are required to impound this amount of water. The total cost of these reservoirs has been estimated at $2,823,217, which is at the rate of $771 per million cubic feet of storage.

ROUTE.

Special Features.

The Barge canal already extends southerly from Seneca lake to the village of Montour Falls. The length of this spur is about

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three miles and it forms the beginning of the proposed Chemung Canal Improvement. From Montour Falls to the divide at Horseheads a waterway must follow the valley of Catharine creek. This valley is a narrow one with steep sides and its floor rises 450 feet in 9 miles. It is already occupied by a trolley line, a steam railroad and a highway. The railroad is located, as a rule, well up the side of the valley and does not interfere with waterway location except at one place. By taking Catharine creek into the canal prism and making certain changes in the highway and trolley alignment, a waterway can be located without encountering any unusual difficulties. However, the narrowness of the valley makes the disposal of excavated material more costly than usual and its steep grade brings the locks close to each other. This latter condition shortens the levels to such an extent that special provisions must be made for filling the locks without a loss of navigable depth. This can be accomplished by side pools and by making the channel of more than the regulation depth, in order to obtain the necessary storage. The difficulty of filling high-lift locks from short levels has been encountered and overcome at the eastern end of the Barge canal, between Crescent and Waterford.

From Horseheads to Elmira the route follows the valley of Newtown creek to the Chemung river. Here it diverges from that of the abandoned Chemung canal, which kept to higher ground and passed through the center of the city of Elmira. The flood waters of Newtown creek can be controlled, when the full sized canal channel has been excavated. Its valley is well adapted for a waterway, being fairly broad and possessing much longitudinal slope. By following the general direction of this stream through Elmira comparatively few buildings are encountered and by controlling floods a positive benefit to contiguous property would result.

From Elmira to the Pennsylvania state line the route follows in general the channel of the Chemung river. During times of flood no obstructions will be present to impede the flow of this river, because the necessary dams would be movable and of the bridge type,— that is to say, the dams would have gates that can be lifted above the highest water. The straightening and deepening of the natural channel, on the other hand, will assist in the rapid passage of flood water and prevent it from overflowing the river banks. During times of ordinary flow the gates of these dams will be used to control pool levels, which, in conjunction with the locks and the dredged channel, make the river navigable.

Before finally leaving New York state the Chemung river flows for about two miles in Pennsylvania. On the New York side of the line, north of this loop, the ground is not adapted to canal location. In order to investigate completely the project of the Chemung Canal Improvement, a survey, plans and estimate were prepared for this loop in Pennsylvania. As will be seen by this report, the estimate of work that is outside of New York state has been separately itemized.

Description.

Below is given a description which covers the entire route of the proposed Chemung Canal Improvement.

Beginning at the southern limits of what is known as Barge canal contract I, in the village of Montour Falls, the route of the proposed waterway extends southerly and follows the valley of Catharine creek, until the divide near the village of Horseheads is reached; thence it crosses this divide into the valley of Newtown creek; thence down the valley of Newtown creek to the Chemung river; thence down the valley of the Chemung river, cutting off such crooks and bends of the river as may be necessary, until the Pennsylvania state line is reached near Waverly.

ESTIMATE.

Details.

In order to prepare the estimate with a sufficient amount of detail, it was found necessary to use computation sheets to the number of 190. Consequently, it was not convenient to have the details of the estimate attached to this report.

Unit Prices.

From Barge canal operations and other sources, data was collected for the purpose of determining a fair price for each item of the estimate. In the case of excavation, for instance, a change of a few cents will increase or diminish the total cost a vast

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amount, on account of the figures that represent this quantity being so very great. Consequently, great caution was employed in determining what seemed to be a suitable price and particularly so when dealing with the major items of the estimate. Below will be found a statement of the principal unit prices:

Excavation. A composite price was determined, viz:	
Hardpan, gravel and sand, per cubic yard....	$0 40
Gravel, clay, fine sand and loam, per cubic yard	35
Gravel, stiff clay and sand (in river channel), per cubic yard........................	55
Clay, sand and gravel (for small structures), per cubic yard.........................	60
Embankment, per cubic yard................	20
Wash wall, per cubic yard..................	2 50
Puddle, per cubic yard....................	1 50
Paving, per square yard....................	2 00
Concrete (the price in each case depending upon the size and location of the structure) per cubic yard	7 00 to 8 00

Percentage of Rounding.

When a preliminary estimate of the cost of doing work has been compiled, it is imperative that an allowance should be made for unforeseen contingencies. The customary way of doing this is to increase the total estimated cost by a certain per cent. The cost of properly controlling the finances, assigning the contracts, laying out and superintending a large public work has been considered as amounting to 10 per cent of the entire amount spent for the improvement. It has been deemed reasonable also to add another 10 per cent to cover unforeseen construction difficulties and change of market prices. Accordingly 20 per cent has been added to the estimated cost and the nearest round figures are used to express the total.

Summary.

By referring to the attached map, it will be seen that the route of the proposed canal can be conveniently divided into the following parts:

(1) Montour Falls to north end of the summit level.

(2) North end of summit level to the Chemung river at Elmira.

(3) Elmira to Pennsylvania state line near Chemung village.

(4) Loop in the state of Pennsylvania.

(5) Loop in New York state from Pennsylvania loop to the state line near Waverly, N. Y.

In order to cover the remaining portions of the estimate numbers must be assigned, as follows:

(6) Feeder and controlling works.

(7) Storage reservoirs and accessories.

Table of Cost.

PART NUMBER.	Estimated cost.	Estimated cost, plus 20 per cent.	Per cent of total length.	Per cent of entire cost.	Approximate cost per mile.	Miles.
1	$6,077,682	$7,293,219	24	28	$838,000	8.7
2	2,481,625	2,977,950	29	11	276,000	10.8
3	6,947,509	8,337,011	34	31	652,000	12.8
4	908,077	1,089,692	5	4	605,000	1.8
5	1,817,565	2,181,078	8	8	753,000	2.9
6	1,162,968	1,395,562	....	5	117,000	11.9
7	2,823,217	3,387,860	....	13	....	....
Total	....	$26,662,372	....	....	....	....

Say the total cost in round figures is $26,500,000.

REPORT ON THE PROPOSED IMPROVEMENT OF THE GLENS FALLS FEEDER.

Before entering into a discussion of routes and costs of a canal of Barge canal dimensions along the line of what is known as the Glens Falls feeder, a brief description of this existing canal and the purpose which it serves may help in obtaining a clearer conception of the location for the proposed enlarged canal and to the line of reasoning followed in arriving at the various conclusions.

The existing Glens Falls feeder extends from a point on the summit level of the old Champlain canal in the vicinity of Hudson Falls to a point on the Hudson river about one and one-half miles above Glens Falls, a total distance of about seven miles. The feeder not only supplies water for the summit level of the old Champlain canal, but is navigable for boats of from 100 to 150 tons capacity. At the present time an improvement is being made on the feeder that will not increase its dimensions to an extent that will allow for the use of larger boats, but will insure the passing of water through the feeder in the amount of 300 cubic feet per second for supplying the summit level of the improved Champlain, or Barge canal, by making use of the old Champlain canal from its junction with the feeder north to a point in the vicinity of Dunhams Basin, where a lateral ditch will be constructed to connect with the improved Champlain canal.

The location of the existing Glens Falls feeder is through the village of Hudson Falls and the city of Glens Falls, and these municipalities depend to a certain extent upon the feeder for transporting commodities, and it is safe to assume that, should a canal be constructed of Barge canal dimensions, the various industries along the canal would ship their finished product — in part at least — over the canal, which is not the case at the present time, as these shipments are almost invariably made by rail, due to the fact that boats which can navigate the present

Glens Falls feeder are limited to such a small capacity that the rates on water-borne shipments do not prove attractive.

As a general proposition there are two routes available for the construction of this proposed canal and these may be distinguished as the "river line" and the "land line."

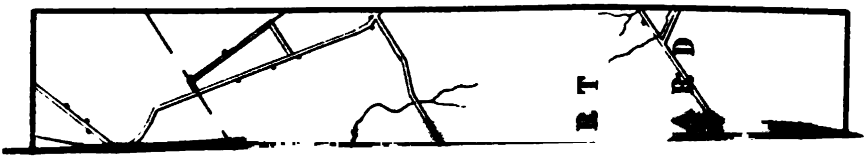
The river line begins at the feeder dam, which is about one and one-half miles above Glens Falls, and follows the bed of the Hudson river to a point below lock No. 7 at Fort Edward, where the river has been deepened and is a part of the improved Champlain Barge canal — a total distance of eight miles.

The land line begins at the feeder dam and follows the alignment of the existing Glens Falls feeder to a point between locks Nos. 12 and 13, which is at the plant of the Kenyon Lumber Company in the village of Hudson Falls. The route at this point leaves the existing Glens Falls feeder and, following a southerly course along the eastern limits of the village of Hudson Falls, reaches by the aid of a flight of locks the old Champlain canal just north of the village of Fort Edward. From this point to a junction with the improved Champlain canal three routes have been examined. Route No. 1 continues on this southerly course and crosses the old Champlain canal and the Delaware and Hudson railroad and reaches the improved Champlain canal at a point about one-fourth of a mile below lock No. 8 — a total distance of about 7.6 miles.

Route No. 2, from the foot of the flight of locks, follows along the old Champlain canal to lock No. 15 at Fort Edward and then, following the line of the old Fort Edward feeder through the village of Fort Edward, it finally reaches the Hudson river at a point between the International Paper Company's dam and the Barge canal terminal — a total distance of 8.9 miles.

Route No. 3, from the foot of the flight of locks, follows the line of the old Champlain canal through the village of Fort Edward and reaches the improved Champlain canal at a point just above lock No. 7 — a total distance of nine miles.

As previously stated, a possible route for the proposed canal would be to follow the bed of the Hudson river from the feeder dam above Glens Falls to Fort Edward. No attempt has been made to submit a detailed report on the cost of this line, for the following reasons: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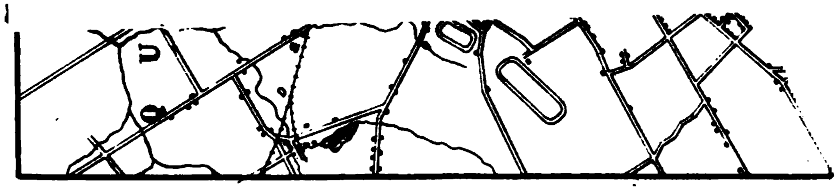
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The cost of excavating a channel, which for practically its entire length is through rock, would be excessive.

The damage suffered by the various power developments along the routes would, I believe, in itself show that it would not be feasible to construct the canal following the river line, for the same amount of water must be passed through the Glens Falls feeder for the purpose of feeding the summit level of the Barge canal regardless of the location of the proposed enlarged canal and consideration must be taken of this very important fact, namely, that any damage suffered by the power developments affects directly various industries that the proposed canal will serve, and care must be taken that in constructing a waterway intended to promote the general welfare of a community it shall never work a hardship on the people.

In view of the above I have deemed it advisable to limit the study of routes to various modifications of the land line, but I believe that in introducing a bill in the Legislature to provide funds for constructing this canal the bill should be so drawn that the State Engineer would be given the authority to construct this canal either as a whole or in part along the river line, should future investigation deem it so advisable.

Believing that a land line is the most feasible route to follow, I have prepared estimates on the cost of the canal upon three different routes, all of which are land lines. In preparing these estimates, I have relied on not only the results of the actual surveys which were made with the sole object of obtaining information for making these estimates, but I have also taken the results of surveys that were made for determining the location of the Barge canal through this particular section and the surveys made at the time of preparing plans to improve the Glens Falls feeder made necessary by the construction of the improved Champlain, or Barge canal. In arriving at the costs of the various structures, I have used, where possible, the same designs as used on the Barge canal. Where it has been impossible to find a structure that would very closely approximate the size of the structure required for this proposed canal, a new design has been made to fit the conditions as found. As for prices, I have used those which have been found by actual experience to hold on similar work in this locality.

The three possible routes which have been investigated in connection with this land line have already been referred to and designated as routes Nos. 1, 2 and 3. The estimated cost includes construction, land damages, engineering and contingencies.

The estimated cost of route No. 1 is $9,000,000 and the length is 7.6 miles.

The estimated cost of route No. 2 is $10,000,000 and the length is 8.9 miles.

The estimated cost of route No. 3 is $10,000,000 and the length is 9 miles.

The above estimates are made for a canal that will extend through the city of Glens Falls to the feeder dam. Should it be deemed advisable to extend the canal only to Glens Falls, it would decrease the cost of each line by $1,400,000 and the length by about one and one-half miles.

In my estimation route No. 1 should be given the most favorable consideration in selecting the location for the proposed canal and in arriving at this conclusion I am governed by the following facts:

Route No. 1 is the least expensive to build. The length of the canal following route No. 1 is less by about 1.4 miles than by following either routes Nos. 2 or 3. The general alignment of the canal by following route No. 1 is far superior to either routes Nos. 2 or 3, not only from the standpoint of the boatmen who will navigate the canal but also from the fact that routes Nos. 2 and 3 pass through the heart of the village of Fort Edward, which to my mind is not to be considered to the advantage of the village, but rather to its disadvantage.

In considering the question of the water supply for this canal, route No. 1 appears to be the most feasible. Examination of the plan will show that the only water which passes through the feeder that can be considered as not available for supplying the summit level of the Barge canal — which is the primary object of the feeder — is that used in operating the last lock before entering the improved Champlain canal and this amount is very slight. Accordingly, as a general proposition, it can be stated that the additional water that must be diverted from the Hudson river (over the amount necessary to supply the Barge canal) to

operate this proposed canal will not to any extent affect power developments on the Hudson river between the feeder dam and Fort Edward.

The question as to whether the State of New York would be justified in spending the amount of money necessary to construct this canal is subject to discussion and in my opinion the feasibility of constructing the canal depends on the policy to be adopted by the State in treating certain projects which relate to the water storage on the upper Hudson river and the reforestation of the Adirondacks.

From the results of investigations I believe that the average tonnage handled on the present Glens Falls feeder amounts to about 200,000 tons annually. Considering the saving that would be made on the cost of transporting this tonnage, together with the increase in shipments that might naturally be divirted to an enlarged canal, I do not consider the expense of constructing this canal to be justifiable.

Should the project of constructing a storage reservoir on the upper Hudson river receive favorable consideration and the flow of the river regulated to such an extent that the various industries could depend on the uninterrupted flow of the river for developing electrical energy for operating the plants, the increase in their output would be enormous and would afford an increased tonnage for the proposed canal.

Another and perhaps a more important project as relating to this section of the state is the policy that must sooner or later be adopted in connection with the forests in the Adirondack mountains. The National Government has adopted a policy which allows of the cutting to a certain extent of the timber on the National forest preserves, which not only is a decided step toward solving the problem of reforestation, but gives to the people lumber at a reduced cost. Should this policy be adopted by the State in connection with the Adirondack forests, industrial delovopment in this section of the state would greatly increase, and thus additional tonnage would be obtained for the proposed canal.

It would seem that the feasibility of constructing this canal is so closely related to the other projects mentioned that they should be considered together and treated as one great project that will tend to develop and conserve the prosperity of the commonwealth.

There are attached to this report:

(1) Map showing routes of proposed canal.

(2) Map showing location, profile and typical sections of route No. 1.

(3) Detailed estimates on the costs of routes Nos. 1, 2 and 3.

All of which is respectfully submitted,

D. B. LA DU,
Division Engineer.

ESTIMATE OF COSTS.

ROUTE NO. 1.

ITEMS.	Quantities.	Price.	Amounts.	Per cent of rounding quantities.
Clearing ... lump sum	1	$1,000.00	$1,000	....
Grubbing ... cu. yds.	10,000	.25	2,500	10
All excavation ... cu. yds.	2,647,000	1.40	3,705,800	10
Sheeting and bracing ... ft. B. M.	775,000	50.00	38,750	10
Channeling ... sq. ft.	120,000	.20	24,000	10
Forming embankment ... cu. yds.	825,000	.20	165,000	10
Lining ... cu. yds.	10,000	1.50	15,000	10
Sawed lumber, yellow pine ... ft. B. M.	173,000	60.00	10,380	5
Sawed lumber, yellow pine, treated ... ft. B. M.	232,000	90.00	20,880	5
White oak in miter-sills and gates ... ft. B. M.	72,000	100.00	7,200	5
Foundation piles ... lin. ft.	737,000	.30	221,100	10
Wooden sheet-piling ... ft. B. M.	1,540,000	50.00	77,000	10
First quality steel piling ... sq. ft.	101,000	1.25	126,250	5
Second-class concrete ... cu. yds.	286,000	7.00	2,002,000	10
Second-class reinforced concrete ... cu. yds.	700	12.00	8,400	10
First-class masonry coping ... cu. yds.	50	30.00	1,500	10
Washwall ... cu. yds.	38,000	2.50	95,000	10
Second-class stone paving ... cu. yds.	1,800	2.25	4,050	10
Cobblestone gutters ... sq. yds.	1,500	1.50	2,250	10
Second-class riprap ... cu. yds.	13,000	3.00	39,000	10
Third-class riprap ... cu. yds.	6,000	3.00	18,000	10
Structural steel ... lbs.	5,000,000	.05	250,000	5
Metal reinforcement ... lbs.	315,000	.04	12,600	5
Iron castings, plain ... lbs.	103,000	.04	4,120	5
Iron castings, machined ... lbs.	58,000	.06	3,480	5
Metal in lock-gates ... lbs.	1,860,000	.06	111,600	5
Metal in buffer-beams ... lbs.	370,000	.06	22,200	5
Metal in lock-valves, ... lbs.	224,000	.11	24,640	5
Wrought iron pipe railing ... lin. ft.	3,000	1.50	4,500	10
Wood block pavement ... sq. yds.	1,300	3.00	3,900	10
Vitrified brick pavement ... sq. yds.	1,000	2.50	2,500	10
Portland cement sidewalks ... sq. ft.	30,000	.20	6,000	11
Stone curb ... lin. ft.	700	1.50	1,050	10
Wooden fence ... lin. ft.	22,000	.30	6,600	00
Lattice railing ... lin. ft.	1,100	2.00	2,200	10
Fender fastenings ... No.	1,500	2.00	3,000	10
Sluice-valves, 2′ x 3′ ... No.	6	225.00	1,350	....
Removing superstructures ... lump sum	1	5,000.00	5,000	....
Maintaining highway traffic ... lump sum	1	3,500.00	3,500	....
Pumping, bailing and draining ... lump sum	1	25,000.00	25,000	....
Electrical equipment ... lump sum	1	327,170.00	327,170	....
Railroad changes ... lump sum	1	75,000.00	75,000	....
			$7,480,740	
Land damages ...	....	....	350,000	
			$7,830,740	
Engineering and contingencies, 15 per cent ...	....	....	1,174,570	
			$9,005,310	
Say ...	....	....	9,000,000	

ROUTE No. 2.

ITEMS.		Quantities.	Price.	Amounts.	Per cent of rounding quantities.
Clearing	lump sum	1	$1,000.00	$1,000	....
Grubbing	cu. yds.	14,000	.25	3,500	10
All excavation, earth	cu. yds.	2,535,000	1.00	2,535,000	10
All excavation, rock	cu. yds.	480,000	3.00	1,440,000	10
Sheeting and bracing	ft. B. M.	735,000	50.00	36,250	10
Channeling	sq. ft.	120,000	.20	24,000	10
Forming embankment	cu. yds.	943,000	.20	188,600	10
Lining	cu. yds.	11,000	1.50	16,500	10
Sawed lumber, yellow pine	ft. B. M.	244,000	60.00	14,640	5
Sawedl umber, treated yellow pine	ft. B. M.	251,000	90.00	22,590	5
White oak in miter-sills and gates	ft. B. M.	76,000	100.00	7,600	5
Foundation piles	lin. ft.	744,000	30	223,200	10
Wooden sheet-piling	ft. B. M.	1,851,000	50.00	92,550	10
First quality steel piling	sq. ft.	98,000	1.25	122,500	5
Second-class concrete	cu. yds.	307,000	7.00	2,149,000	10
Second-class reinforced concrete	cu. yds.	730	12.00	8,760	10
First-class masonry coping	cu. yds.	50	30.00	1,500	10
Washwall	sq. yds	45,000	2.50	112,500	10
Second-class stone paving	cu. yds.	1,600	2.25	3,600	10
Cobblestone gutters	cu. yds.	1,500	1.50	2,250	10
Second-class riprap	cu. yds.	13,400	3.00	40,200	10
Third-class riprap	cu. yds.	4,900	3.00	14,700	10
Structural steel	lbs.	7,420,000	.05	371,000	5
Metal reinforcement	lbs.	312,000	.04	12,480	5
Iron castings, plain	lbs.	134,000	.04	5,360	5
Iron castings, machined	lbs.	80,000	.06	4,800	5
Metal in lock-gates	lbs.	1,901,000	.06	114,060	5
Metal in buffer-beams	lbs.	370,000	.06	22,200	5
Metal in lock-valves	lbs.	250,000	.11	27,500	5
Wrought iron pipe railing	lin. ft.	2,900	1.50	4,350	10
Wood block pavement	sq. yds.	1,300	3.00	3,900	10
Vitrified brick pavement	sq. yds.	900	2.50	2,250	10
Portland cement sidewalks	sq. ft.	30,000	.20	6,000	10
Stone curb	lin. ft.	700	1.50	1,050	10
Wooden fence	lin. ft.	23,000	.30	6,900	10
Lattice railing	lin. ft.	1,100	2.00	2,200	10
Fender fastenings	No.	2,600	2.00	5,200	10
Sluice valves, 2′ x 3′	No.	6	225.00	1,350	....
Removing superstructures	lump sum	1	6,000.00	6,000	....
Maintaining highway traffic	lump sum	1	4,000.00	4,000	....
Pumping, bailing and draining	lump sum	1	25,000.00	25,000	....
Electrical equipment	lump sum	1	333,340.00	333,340	....
Railroad changes	lump sum	1	75,000.00	75,000	....
Lift bridges	lump sum	1	130,000.00	130,000	....
				$8,224,380	
Land damages		....	....	475,000	
				$8,699,380	
Engineering and contingencies, 15 per cent		....	....	1,304,907	
				$10,004,287	
Say		....	....	10,000,000	

ROUTE No. 3.

ITEMS.	Quantities.	Price.	Amounts.	Per cent of rounding quantities.
Clearing ..... lump sum	1	$1,000.00	$1,000	....
Grubbing ..... cu. yds.	15,000	.25	3,750	10
All excavation, earth ..... cu. yds.	2,700,000	1.00	2,700,000	10
All excavation, rock ..... cu. yds.	457,000	3.00	1,371,000	10
Sheeting and bracing ..... ft. B. M.	846,000	50 00	42,300	10
Channeling ..... sq. ft.	120,000	.20	24,000	10
Forming embankment ..... cu. yds.	952,000	.20	190,400	10
Lining ..... cu. yds.	11,000	1.50	15,500	10
Sawed lumber, yellow pine ..... ft. B. M.	233,000	60.00	13,980	5
Sawed lumber, yellow pine, treated ..... ft. B. M.	290,000	90.00	26,100	5
White oak in miter-sills and gates ..... ft. B. M.	72,000	100.00	7,200	5
Foundation piles ..... lin. ft.	800,000	.30	240,000	10
Wooden sheet-piling ..... ft. B. M.	1,690,000	50 00	84,500	10
First quality steel piling ..... sq. ft.	101,000	1.25	126,000	5
Second-class concrete ..... cu. yds.	304,000	7 00	2,128,000	10
Second-class reinforced concrete ..... cu. yds.	900	12.00	10,800	10
First-class masonry coping ..... cu. yds.	50	30.00	1,500	10
Washwall ..... cu. yds.	48,000	2.50	120,000	10
Second-class stone paving ..... cu. yds.	1,800	2.25	4,050	10
Cobblestone gutters ..... sq. yds.	1,500	1.50	2,250	10
Second-class riprap ..... cu. yds.	13,000	3.00	39,000	10
Third-class riprap ..... cu. yds.	5,300	3.00	15,900	10
Structural steel ..... lbs.	667,800	.05	333,900	5
Metal reinforcement ..... lbs.	358,000	.04	14,320	5
Iron castings, plain ..... lbs.	122,000	.04	4,880	5
Iron castings, machined ..... lbs.	58,000	.06	3,480	5
Metal in lock-gates ..... lbs.	1,860,000	.06	111,600	5
Metal in buffer-beams ..... lbs.	370,000	.06	22,200	5
Metal in lock-valves ..... lbs.	224,000	.11	24,640	5
Wrought iron pipe railing ..... lin. ft.	2,900	1.50	4,350	10
Wood block pavement ..... sq. yds.	1,300	3.00	3,900	10
Vitrified brick pavement ..... sq. yds.	900	2.50	2,250	10
Portland cement sidewalk ..... sq. ft.	30,000	.20	6,000	10
Stone curb ..... lin. ft.	700	1.50	1,050	10
Wooden fence ..... lin. ft.	24,000	.30	7,200	10
Lattice railing ..... lin. ft.	2,300	2.00	4,600	10
Fender fastenings ..... No.	2,100	2.00	4,200	10
Sluice-valves, 2′ x 3′ ..... No.	6	225.00	1,350	....
Removing superstructures ..... lump sum	1	7,000.00	7,000	....
Maintaining highway traffic ..... lump sum	1	4.500.00	4,500	....
Pumping, bailing and draining ..... lump sum	1	25,000 00	25,000	....
Electrical equipment ..... lump sum	1	331,570.00	331,570	....
Railroad changes ..... lump sum	1	75,000 00	75,000	....
Lift bridges ..... lump sum	1	67,000.00	67,000	....
			$8,228,470	
Land damages	....	....	450,000	
			$8,678,470	
Engineering and contingencies, 15 per cent	....	....	1,301,770	
			$9,980,240	
Say	....	....	10,000,000	

Report on the Proposed Jamaica Bay-Flushing Bay and Newtown Creek-Flushing Bay Canals, in the Borough of Queens, New York City.

By the provisions of chapter 220 of the Laws of 1913 the State Engineer and Surveyor was required to make the necessary surveys and estimates covering the cost of constructing a canal between Flushing bay and Jamaica bay and from Newtown creek to connect with the proposed canal between Flushing bay and Jamaica bay.

During the summer of 1913 surveys for both of these proposed canals were made, including several variations of routes, and the results of surveys of the most promising routes have been plotted and estimates made, and in this report it is my purpose to treat both canals as separate and distinct propositions.

JAMAICA BAY-FLUSHING BAY CANAL.

History of the Project.

A canal from Jamaica bay to Flushing bay has been advocated for many years. The project was presented to the Barge Canal Terminal Commission in 1910. The Commission recommended in their report that Barge canal terminals be located in Jamaica bay when the improvements contemplated by the city shall have been made and they recommended that a survey be made for the canal by the State Engineer, but went no further.

A bill presented to the Legislature in 1912 for the construction of the canal failed to pass.

Tentative estimates for a canal in a tunnel were prepared by the authorities of the borough of Queens and it was estimated that such a canal would cost about $12,000,000.

Topography.

A cross-section of Long Island between Jamaica bay and Flushing bay shows a stretch of salt meadows from Jamaica bay nearly to the Ridgewood aqueduct, a distance of about two miles, then a gently sloping, sandy plain, varying in height from 20 to 40 feet above mean high tide, extending a distance of about two miles to the region between Liberty avenue and the Long Island railroad and then a steeper, irregular slope to the summit of the "backbone" of the island, composed of glacial drift and till, with a maximum elevation of over one hundred feet just east of Maple Grove cemetery, then a steep descent to the Union turnpike and lastly a level stretch of salt meadow in a deep indentation of the main ridge extending about 3½ miles to Flushing bay. The southerly slope is indented with shallow valleys reaching to the northerly side of the railroad, which afford natural lines for the location of a canal.

Routes Considered.

It has been assumed for the purposes of this estimate that the city of New York will construct the proposed channel in Jamaica bay, together with the basins extending inland from that channel. The cost of the channel between deep water in the East river and Livingston street, the point where the pier and bulkhead lines proposed by the city end, has been estimated as a separate item. It is expected that the Federal government will ultimately improve the channel to this point.

From Jamaica bay the topography indicates a route from either the proposed Bergen basin or Cornell basin to a point east of Van Wyck avenue and south of Liberty avenue. The route from Cornell basin follows Cornell creek for a short distance, bending westerly across the ridge between the creek and the next valley to the west, crosses the Ridgewood aqueduct west of Three-Mile millroad and Rockaway boulevard about one-quarter of a mile west of the junction with Rockaway road, then follows the natural valley through the truck farms, crossing Hawtree Creek road near its junction with Lincoln avenue and Liberty avenue just east of Van Wyck avenue.

The route from Bergen basin would follow the depression west of the Bergen Landing road, crossing Rockaway boulevard and Hawtree Creek road west of Lincoln avenue, then through the depression north of Hawtree Creek road and west of Van Wyck avenue across the latter to join the Cornell creek route just south of Liberty avenue. This route was rejected, as it showed con-

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siderably more excavation than that from Cornell basin and runs through a section which is rapidly being built up.

From Liberty avenue the line runs just east of Van Wyck avenue and nearly parallel to it, following a natural depression through the residential district to the railroad. It crosses the railroad just east of Dunton station, runs thence to the gravel pits on the Maple Grove cemetery property, crosses the summit of the main ridge in the cemetery, following a ravine on the easterly edge of the improved portion, across the Queens boulevard, and then down the ravine across the Union turnpike at the pumping station of the Citizens Water Company to the meadows at the head of Flushing creek. A detour around the westerly side of the cemetery was also surveyed.

From the head of Flushing creek the line runs through the driven-well field of the water company to the head of the 200-foot wide channel planned by the city at Livingston street. Thence it follows the line of the improvement of the Flushing river proposed by the city of New York to Strong's causeway, thence across a bend of the river, rejoining the channel laid out by the city above the Main street bridge of the Long Island Railroad Company and thence following the channel for which appropriations have been made by the Federal government to the point in Flushing bay where the depth is 12 feet at mean low water. Appropriations are available and the Federal government is preparing to deepen the channel to 10 feet at mean low water from the East river to Broadway bridge, Flushing, and 7 feet from Broadway bridge to the Main street bridge of the Long Island railroad.

Another route from Cornell basin was considered. It follows the valley of Cornell creek through Baisley's pond, following a valley to Woodhull Park, crossing the main ridge of the island about at Midland parkway and thence following the valley of Mill creek to its junction with Flushing river. This route involved so much more excavation than the route along Van Wyck avenue that it was rejected.

Tides and Currents.

Simultaneous tidal observations extending over more than a lunar month were made in Cornell creek at the head of the proposed Cornell basin, at Grant street bridge on Newtown creek and at Strong's causeway bridge on Flushing river. It was ascertained that high tide in Jamaica bay occurs about three hours after low tide in Flushing bay. The average daily maximum elevation of Flushing bay above Jamaica bay is 3.8 feet and of Jamaica bay above Flushing bay, 4.3 feet. The extreme differences observed were 4.5 feet and 5.8 feet, respectively. It is estimated that such differences in elevation of water surfaces at each end of the canal would produce average currents of approximately three feet per second, or two miles per hour.

It is also estimated that even if the tides at each end of the canal were simultaneous the current at the Jamaica bay end, due to the rise and fall of the tide at that point, would for several hours each day be two miles or more per hour, which would be exceeded at extreme high and low tides and would be so detrimental to navigation, especially that of low-powered Barge canal boats, that a tidal lock at this point would be necessary. Such currents would easily transport the fine sand through which a large portion of the canal would be cut and would scour the bottom and form bars. More rapid currents would be caused when the differences in elevations of the water surfaces are greater than those observed and such extreme tides may be expected whenever there is a heavy storm occurring simultaneously with the spring tides. A lock with double acting gates at each end of the canal has therefore been provided for in the estimates,— one where the line crosses the bend in Flushing river below Strong's causeway and one south of the Ridgewood aqueduct at the Jamaica bay end. The locks are of standard Barge canal dimensions, 310 ft. x 45 ft. x 12 ft.

Types of Canal.

Three types of canal for this line have been considered:

(1) A sea-level, open-cut canal with two locks.

(2) A high-level, open-cut canal with four or more locks.

(3) A sea-level canal in a tunnel through the high portion of the island.

Sea-Level Canal.

A sea-level canal with a lock at each end would be the cheapest type and while it would be objectionable from many points of view it has been made the basis of the estimates on account of the comparative cheapness.

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High-Level Canal.

A high-level canal with four or more locks has been suggested, so as to make possible a narrower cut, less expensive bridges and less disturbance of the city's plans for streets. Such a canal would have to be made tight by means of puddle or concrete to prevent the water leaking out through the sandy soil. It was found on investigation that the cost of pumping for two levels, one at 70 feet and one at 35 feet elevation, was so enormous that the investigations were discontinued.

Tunnel Canal

Another scheme for avoiding entirely an open cut, many bridges, and the disturbances of street plans — by putting the canal in a tunnel from Liberty avenue to Union avenue — has been suggested and is favored by the authorities of the borough of Queens.

It was therefore decided to design a double conduit of reinforced concrete with two channels of 50 feet each, having columns or posts between the two channels, which would permit of the rapid and easy displacement of water by moving a boat with a comparatively large ratio of cross-section of the canal to that of the boat, and to estimate the cost of constructing such a tunnel by the "cut and cover" method. Such a tunnel would permit boats of the largest size which could be accommodated by the Barge canal locks to pass each other. The cost would be considerably larger that that of either of the open-cut schemes, but would probably meet with greater favor by the property owners of the district traversed by the canal.

Sections.

For these canals sections similar to those of the improved Erie canal have been chosen. The width on the bottom is 75 feet; the sides slope at 1 on 2; bermes 10 feet wide have been provided on each side four feet above mean high water, and to prevent scour from currents and wash from vessels the banks are protected from the bottom to the bermes with riprap and wash wall along the greater part of the line. The bottom south of the lock at the Flushing end is at 12 feet below the elevation of mean low water in Jamaica bay (Canarsie) and north of the lock 12 feet below mean low water at College Point, on account of the different range of tide. It is possible that some of the riprap could be omitted and that with certain methods of construction some saving could be made, if the sections were modified so as to dispense with the bernnes.

Right of Way and Damages.

At present it is stated that land along the line of the canal may be purchased for about one-third more than the assessed valuation. As the assessed valuation is increasing very rapidly, it has been considered best to estimate the cost of the right of way and all damages to adjacent property, except wells, etc., but not including buildings, at twice the 1914 assessed valuation as shown on the tentative maps of the New York City Department of Taxes.

In the tunnel canal it is estimated that easements might be purchased for about one-half the present assessed valuation, including the use of the land on the surface during the construction.

The value of the buildings is based on the assumption that their present value is about double the assessed valuation and that their value would be diminished one-half by moving them to new sites. The net cost to the State on this basis would be about equal to the present assessed valuations.

Estimated Costs.

The estimated cost of a canal with and without a tunnel, including the cost of engineering, land damages and contingencies, is as follows:

Sea-level canal, Cornell basin to East river	$13,211,042
If United States government makes channel from Livingston street to East river, deduct	618,468
	$12,592,574
Sea-level canal, as above, with tunnel from Liberty avenue to Union avenue	$20,956,476
If United States government makes channel from Livingston street to East river, deduct	618,468
	$20,338,008

Discussion of the Advantages Claimed.

The advantages claimed for such a canal were set forth at length in the report of the Barge Canal Terminal Commission and may be summarized as follows:

(1) A direct route for the Barge canal traffic from the Hudson river *via* the Harlem and East rivers to the proposed "sub-port" in Jamaica bay, avoiding the additional distance through the Narrows, the congested portion of the Hudson river and the rough seas at the entrance to Jamaica bay.

(2) The creation of additional water-front.

(3) The reclamation of a large area of marsh land.

(4) The disposition of sewage.

Another advantage claimed is that such a canal would link up the Barge canal and the Hudson and East rivers with the proposed inland waterway along the south side of Long Island.

The distance from a point in the Hudson river opposite the entrance to the Harlem Ship canal to Canarsie on Jamaica bay *via* the Narrows and Rockaway inlet is about 34½ statute miles. The distance from the same point to Jamaica bay *via* the Harlem river, Hell Gate and the proposed Jamaica Bay–Flushing Bay canal is about 24½ miles, the saving in distance being 10 miles.

If the Bronx kills are deepened so as to be navigable, the saving would be about 12 miles. No appropriation for the improvement of Bronx kills has as yet been made, but recommendations for such improvement have been made by the United States engineers in charge of the district.

If the proposed canal from Gravesend bay to Sheepshead bay is built, the extra saving in distance would be only about one mile.

If the average speed is assumed at 3½ miles per hour, the saving in time by canal would be probably less than 3 hours between the Hudson river and Jamaica bay, after deducting the time required for locking.

As for the dangers of navigation due to the congested condition of the Hudson river, while they are increasing, it is submitted that the congestion there will hardly be less than it is in the Harlem river or than it will be in that river when the Barge canal terminals at Sherman's creek, Mott Haven and on the eastern shore of the borough of the Bronx are completed.

The open waters traversed on the route *via* the Narrows are, first, the Upper bay, and second, the Lower bay from the western end of Coney island to Rockaway inlet. The Upper bay is not so large a body of water as Oneida lake, which is traversed by the Barge canal. The portion of the Lower bay traversed by this route is, however, much exposed and is subject to heavy seas in stormy weather, but this stretch of dangerous navigation could be avoided by building the proposed Gravesend Bay–Sheepshead Bay canal.

The money saving by reason of the shorter route of the Jamaica Bay–Flushing Bay canal may be estimated as follows:

The Committee on Canals of 1899 reported that the probable cost of transportation on the Barge canal would be 0.52 of a mill, or $0.00052, per ton-mile. For one million ton-miles this would be $520, or, for a saving of 12 miles, $6,240 per million tons. For a canal costing, say, only $10,000,000 the annual interest charge at 4½ per cent would be $450,000, and to balance this annual cost the traffic would have to amount to about 70 million tons, which is several times the highest estimate of the capacity of the Barge canal and more than the total freight handled on both sides of the Hudson river from the Battery to Yonkers in 1912.

The building up of the districts through which the canal would run is more of an argument in favor of the constructing of such a canal by the city than by the State, as this benefit would be largely local.

The promotion of the plans for an inland waterway along the south side of Long Island is one which might be considered as being a benefit to all the people of the state.

The canal might have some advantages for the disposition of storm water and purified house sewage, but this again would be more of a local benefit than one for the whole State.

It appears for the above that, considering the great cost of such a canal, no direct saving or benefit to all the people of the state can be deduced from the advantages claimed for it and that reasons for its construction must be sought in the indirect and local advantages rather than in such direct saving of time and cost of transportation as would benefit the whole State.

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NEWTOWN CREEK-FLUSHING BAY CANAL.

The idea of constructing a canal between Newtown creek and Flushing bay was first advanced more than one hundred years ago and since that time various projects have been considered.

Topography.

The topography of the region between Newtown creek and Flushing river shows the valley of Maspeth creek extending inland nearly to the present main line of the Long Island railroad at Winfield, and the marshes of Flushing river and its tributary Horse brook extending from Flushing bay to Grand street, Elmhurst, the valley of the latter continuing nearly to the railroad. Another area of low marsh land, known as Train's meadows, extends from a point in Flushing bay just south of Sanford Point and North Beach to Woodside. Separating the eastern and western valleys is the ridge of glacial drift about three-quarters of a mile wide and from 40 to 50 feet high.

Routes Considered.

From Newtown creek to Newtown (Borden) avenue three routes have been examined,— one following Maspeth creek all the way, a second following the creek to the old main line of the Long Island railroad, thence crossing a high sandy ridge to Maurice avenue and thence along the lines of the avenue, and a third from a point on Newtown creek opposite the English kills running parallel to Maspeth and Maurice avenues.

The first showed the least excavation, but the curves were too sharp, the third required more excavation than the second and both were rejected in favor of the second.

From Newtown avenue the line chosen for the estimate follows the line of Maurice avenue in the valleys of Maspeth creek and Horse brook. It passes through the well-field of the Urban Water Co. at Newton avenue, crossing the Long Island railroad main line and the New York Connecting railroad just north of Maurice avenue and going to Grand street, Elmhurst, and thence through the valley and marshes of Horse brook to a junction with the Jamaica bay line just above Strong's causeway. In estimating this route there is included a relocation of Maurice avenue at

Elmhurst opposite Mt. Zion cemetery and just east of the old main line of the railroad.

Another route — through Train's meadows — was examined. It leaves the above route at the easterly side of Mt. Zion cemetery and follows the low land to Woodside, crossing the railroad at Roosevelt avenue and Broadway near Fillmore avenue; thence in Train's meadows to Jackson's mill creek and down the valley of the creek to Flushing bay at Sanford Point and thence in the bay across the shallow portion to a point in the East river where the depth is 12 feet at mean low water. This route was rejected, as the estimated excavation was about 40 per cent more than the route selected, the value of the right of way much greater and the number of bridges greater. If this canal were built as a separate enterprise and not in conjunction with the Jamaica bay line, the route by way of Train's meadows might have some advantage over the one selected.

Tides and Currents.

The tidal observations, mentioned before, show that high and low water in Flushing river occur about 2½ hours later than high and low water in Newtown creek. The maximum differences of elevation of water surface in the two streams occur at the times of high and low water in Flushing creek. The average daily maximum elevation of the surface of Flushing river above Newtown creek is about 3.3 feet and of Newtown creek above Flushing river, about 3.35 feet. The extreme difference observed in this survey was 5.8 feet, which occurred in both cases.

It is estimated that to restrict the currents, which would be caused by such tidal differences, to a velocity less than two miles per hour, so as not to interfere with navigation, a lock at each end of the canal would be necessary. It is also considered advisable on account of the sandy material of the banks to protect them for a large portion of the length with riprap and wash wall. A lock has therefore been provided for at Newtown creek. The lock at the Flushing end is included in the estimate of the Jamaica bay line.

Type of Canal.

A sea-level canal is the only type which has been considered for this line.

Sections.

The standard section of the Barge canal, having a bottom width of 75 feet and a depth of 12 feet at mean low water, has been adopted for the purpose of estimating.

Estimates.

The estimated cost of this canal, including engineering, land damages and contingencies, is $5,894,144.

Discussion of the Advantages Claimed.

The advantages claimed for this canal are as follows:

(1) The increase of wharfage space.

(2) The commercial development of the district traversed by the canal.

(3) The disposition of sewage.

(4) The avoidance of the dangerous navigation of Hell Gate and the East river.

The increase of wharfage by the construction of such a canal, if it were made wide enough for that purpose, would be considerable and the commercial development of the district would naturally follow. Such benefits are more of a local character than of advantage to the whole State.

Such a canal would offer some advantages for sewage disposal, but the borough authorities have stated that other plans for sewage disposal are being made and that the existence of an open channel through the borough would in many ways be more of a disadvantage than a benefit.

There is said to be some commerce between Long Island sound and Newtown creek which would go through such a canal rather than through Hell Gate, but the volume of such commerce is at present not very great.

Such a canal might, in its entirety, be considered as a Barge canal treminal and as such might be of benefit to the whole State, but there are available stretches on Flushing bay, Flushing creek, Newtown creek and Maspeth creek which could be made into Barge canal terminals, equivalent to such a canal, without the cost of the expensive construction from Maspeth to Elmhurst.

There are attached to and forming a part of this report the following maps and estimates:

(1) Plan and profile of the proposed Jamaica Bay–Flushing canal.

(2) Typical sections of the proposed Jamaica Bay–Flushing Bay canal.

(3) Plan and profile of the proposed Newtown Creek–Flushing Bay canal.

(4) Typical sections of the proposed Newtown Creek-Flushing Bay canal.

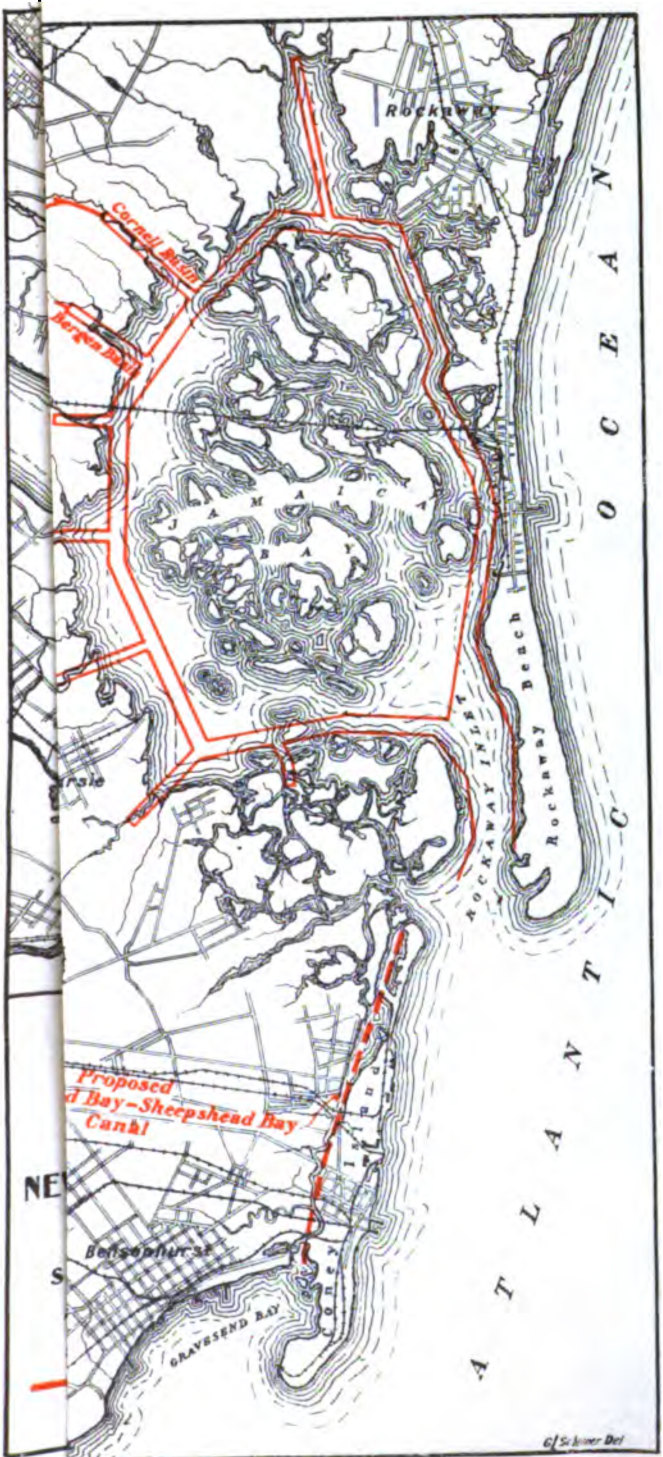
(5) Map showing locations of the proposed Jamaica Bay–Flushing Bay and Newtown Creek–Flushing Bay canals, together with various routes surveyed in determining the locations of these proposed canals and the suggested location of the Gravesend Bay–Sheepshead Bay canal.

(6) Detailed estimate of the cost of the proposed Jamaica Bay–Flushing Bay canal.

(7) Detailed estimate of the cost of the proposed Newtown Creek–Flushing Bay canal.

All of which is respectfully submitted,

D. B. LA DU,
Division Engineer.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ESTIMATES OF QUANTITIES AND COSTS.

Jamaica Bay — Flushing Bay Canal.

Sea-level Canal from the Head of the Proposed Cornell Basin, Jamaica Bay, to Deep Water in East River at the Entrance of Flushing Bay. Length, 10.53 *miles.*

Excavation, dry, 6,646,000 cu. yds., at 50c		$3,323,000
Excavation, wet, 4,422,000 cu. yds., at 25c		1,105,500
Riprap, 200,000 cu. yds., at $1		200,000
Wash wall, 117,000 cu. yds., at $2.50		292,500
Structure at L. I. R. R. crossing, Jamaica, 1		1,906,000
Highway bridges, 10		1,538,000
Pipe crossings		100,000
Locks, 2 at $250,000		500,000
Right of Way Required.		
Salt meadow land, 12.3 acres; assessed valuation	$6,150	
Salt marsh land, 56.4 acres; assessed valuation	40,000	
Farm land, 46.53 acres; assessed valuation	110,235	
City land, 71.93 acres; assessed valuation	661,913	
Cemetery land, 25.04 acres; assessed valuation	64,938	
	$883,236	
Add 100 per cent	883,236	
		1,766,472
Buildings, 161; net cost		277,730
		$11,009,202
Engineering and contingencies, 20 per cent		2,201,840
Total		$13,211,042

Sea-level Canal from the Head of the Proposed Cornell Basin, Jamaica Bay, to Deep Water in East River at the Entrance of Flushing Bay — Tunnel Section between Liberty Avenue and Union Avenue, Sta. 145 *to Sta.* 240.

Excavation, wet, 3,763,000 cu. yds., at 25c	$940,750
Excavation, dry, 1,155,000 cu. yds., at 50c	577,500
Excavation (open cut for tunnel), 6,570,800 cu. yds. at 50c	3,285,400
Wash wall, 83,190 cu. yds., at $2.50	207,975
Riprap, 142,460 cu. yds., at $1	142,460
Backfill, 3,967,000 cu. yds., at 20c	793,400
Concrete, 930,300 cu. yds., at $7	6,512,100
Metal reinforcement, 98,135,000 lbs., at 3½c	3,434,725
Highway bridges, 4	291,000
Locks, 2	500,000

RIGHT OF WAY REQUIRED.

Open Section.		
Salt meadow land, 12.3 acres; assessed valuation...	$6,150	
Salt marsh land, 56.4 acres; assessed valuation.....	40,000	
Farm land, 46.53 acres; assessed valuation.........	110,235	
	$156,385	
Add 100 per cent............................	156,385	
		312,770
Tunnel Section.		
City land, 57.54 acres; assessed valuation..........	$427,000	
Cemetery land, 20.53 acres; assessed valuation......	53,300	
	$480,300	
Less 50 per cent............................	240,150	
		240,150
Buildings, 133; assessed valuation $225,500; net cost..........		225,500
		$17,463,730
Engineering and contingencies, 20 per cent....................		3,492,746
Total..		$20,956,476

Sea-level Canal from the Head of the Proposed Government Improvement in Flushing Creek at Livingston Street to Deep Water in East River at the Entrance of Flushing Bay. Length, 4.89 *miles.*

Excavation, wet, 1,623,000 cu. yds., at 25c....................		$405,750
Riprap, 18,800 cu. yds., at $1................................		18,800
Wash wall, 11,000 cu yds., at $2.50...........................		27,500

RIGHT OF WAY REQUIRED.

Salt marsh land, 36.2 acres; assessed valuation.....	$31,670	
Add 100 per cent............................	31,670	
		63,340
		$515,390
Engineering and contingencies, 20 per cent....................		103.078
Total..		$618,468

NEWTOWN CREEK–FLUSHING BAY CANAL.

Sea-level Canal from the Channel in Newtown Creek to a Junction with the Proposed Jamaica Bay–Flushing Bay Canal at Strong's Causeway, Flushing River. Length, 5.4 miles.

Excavation, dry, 1,871,315 cu. yds., at 50c		$935,657
Excavation, wet, 2,387,672 cu. yds., at 25c		596,918
Wash wall, 45,316 cu. yds., at $2.50		113,290
Riprap, 81,563 cu. yds., at $1		81,563
Retaining wall, 600 lin. ft., at $60		36,000
Lock, 1		250,000
RIGHT OF WAY REQUIRED.		
Salt marsh land, 66.43 acres; assessed valuation	$61,375	
City land, 83.12 acres; assessed valuation	378,335	
Cemetery land, 0.67 acre; assessed valuation	1,675	
Relocation of Maurice avenue, 6.14 acres; assessed valuation	23,009	
	$464,394	
Add 100 per cent	464,394	
		928,788
Buildings, 64; net cost		229,425
Sewer, gas and water pipe crossings, 8		119,700
Bridges, 9		1,531,468
Relocation of Maurice avenue, 4,350 lin. ft.		37,728
Damages to pumping stations and cemetery		51,250
		$4,911,787
Engineering and contingencies, 20 per cent		982,357
Total		$5,894,144

REPORT

OF

COÖPERATION OF UNITED STATES GEOLOGICAL SURVEY

WITH

STATE ENGINEER AND SURVEYOR

OF THE

STATE OF NEW YORK

1913

COÖPERATIVE TOPOGRAPHIC SURVEY OF NEW YORK.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON.
OFFICE OF THE DIRECTOR.

November 18, 1913.

Hon. JOHN A. BENSEL, *State Engineer and Surveyor, Albany, New York:*

Sir.— I have the honor to transmit herewith a report made by Frank Sutton, Geographer in charge of the Atlantic Division of this Survey, on results of topographic work prosecuted in the State of New York during the period beginning October 1, 1912, and ending September 31, 1913. . . .

You will note that the first three months covered by this report were also covered by the one sent you November 6, 1912, which was for the calendar year 1912.

Yours very truly,

GEO. OTIS SMITH,

Director.

REPORT OF TOPOGRAPHIC SURVEYS IN COÖPERATION BETWEEN THE UNITED STATES GEOLOGICAL SURVEY AND THE STATE OF NEW YORK FOR THE YEAR BEGUN OCTOBER 1, 1912, AND ENDED SEPTEMBER 30, 1913.

In accordance with the coöperative agreement signed July 11, 1913, by George Otis Smith, Director, for the United States Geological Survey, and by John A. Bensel, State Engineer and Surveyor, July 18, 1913, for the State of New York, the Federal Survey allotted $10,000 and the State $10,000, for coöperative topographic surveys in the state of New York during the fiscal year July 1, 1913, to June 30, 1914.

The following is a summary of the field and office work accomplished from October 1, 1912, to September 30, 1913, under the general direction of R. B. Marshall, Chief Geographer, and under the immediate supervision of Frank Sutton, Geographer in charge of the Atlantic Division.

The work from October 1, 1912, to June 30, 1913, was continued under the appropriation for the fiscal year ended June 30, 1913, the results accomplished during the first six months of that year being given in the report of the State Engineer and Surveyor for 1912.

FIELD WORK.

Quadrangle.	COUNTIES.	Published on scale of	Area mapped.	PRIMARY LEVELS.		TRAVERSE.			TRIANGULATION.	
						PRIMARY.		SECONDARY.		
				Miles.	Permanent B. M's.	Miles.	Marks.	Miles.	Stations occupied.	Stations marked.
			Sq. miles.							
Canaserage...	Allegany and Livingston............	1 : 62,500	69	....	......	....	....	373	2	1
Chateaugay...	Clinton and Franklin	1 : 62,500	199	99	22	....	....	745	......	....
Corning......	Steuben............	1 : 62,500	178	25	5	....	....	334	......	....
Gouverneur...	St. Lawrence........	1 : 62,500	204	70	21	....	....	1,173	......	....
Hornell......	Allegany, Livingston, Steuben.....	1 : 62,500	......	....	......	....	....	......	4	3
Lake Bonaparte.......	Jefferson, Lewis, St. Lawrence.........	1 : 62,500	160	....	......	....	....	890	......	....
Milford (N. Y. part).......	Sullivan..........	1 : 62,500	10	....	......	....	....	......	.....	....
Oswegatchie..	Herkimer, Lewis, St. Lawrence.........	1 : 62,500	......	....	......	58	6	......	......	....
White Lake...	Sullivan............	1 : 62,500	......	....	......	....	....	......	7	4
Totals....	....	....	820	194	48	58	6	3,515	13	8

The following members of the United States Geological Survey were engaged in the field work:

Topographic Mapping:

Hersey Munroe, topographic engineer.
Glenn S. Smith, topographic engineer.
R. C. McKinney, topographic engineer.
J. F. McBeth, topographer.
J. M. Whitman, topographer.
W. H. S. Morey, assistant topographer.
S. P. Floore, assistant topographer.
R. L. Harrison, assistant topographer.
R. A. Kiger, assistant topographer.
T. F. Slaughter, assistant topographer.
Roscoe Reeves, junior topographer.
E. E. Witherspoon, junior topographer.

Levels:

A. J. Kavanagh, junior topographer.
K. W. Trimble, topographic aid.

Primary Traverse and Triangulation:

S. S. Gannett, geographer.
G. T. Hawkins, topographic engineer.
J. B. Metcalfe, Jr., assistant topographer.
A. J. Kavanagh, junior topographer.

OFFICE WORK.

The office drafting of the Corning, Churubusco, and Number Four topographic maps was completed and the maps transmitted for engraving before July 1, 1913.

The adjustment of the primary levels for the Bonaparte, Churubusco (formerly Ellenberg) and Corning quadrangles was completed and the field notes typewritten and prepared for publication. Bulletin No. 514, showing the results of spirit leveling in the state of New York from 1906 to 1911, was published.

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